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THE ROLE OF AROUSAL AND COGNITIVE COMPLEXITY IN
SUSCEPTIBILITY TO SOCIAL INFLUENCE

by



VERA KILIAN CORFIELD

A DISSERTATION

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "The Role of Arousal and Cognitive Complexity in Susceptibility to Social Influence" submitted by Vera Kilian Corfield in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

ABSTRACT

The primary purpose of this study was to explore the relationship between measures of arousal and cognitive complexity, and to examine arousal reduction as a variable mediating communication acceptance. A secondary purpose was to explore the relationship between communication source, level of complexity, and susceptibility to social influence.

Subjects rated at four system levels of cognitive complexity performed an ambiguous task under neutral or arousing instructions. Evaluations of performance, attributed to a high authority, highly valued or somewhat devalued source were presented. A no-communication control group was also included. The effectiveness of social influence procedures was measured in terms of change in self-evaluation from pre- to post-communication administrations of a self concept test. Heart rate was used as an objective indicator of arousal.

Results indicated that System III subjects changed self-evaluations more than subjects in any other system. System I subjects produced the lowest mean change.

Few significant differences among systems were found with respect to arousal. However, there was a weak positive association between base heart rate and change in self-evaluation for subjects in Systems I and III. It was suggested that a change in procedure might enhance the differences found.

Feedback on task performance functioned to reduce arousal level. An association between arousal reduction and change in self-evaluation was found for Systems III, I and IV, the degree of association following that order.

The presence of a communication produced a change in self-evaluation for all systems with the valued communication having a somewhat greater influence than the devalued communication. No interaction effect between system levels and communications was found.

Change in self-evaluation was associated with situational factors for Systems I and III, but change in Systems II and IV was associated with internal anchors. System IV appeared to respond in the most complex way. For System IV subjects, susceptibility to influence was associated with both situational factors and internal anchors.

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Vera Kilian Corfield

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INTRODUCTION

The degree to which individuals are susceptible to social influences is a subject of considerable theoretical and practical importance. From a theoretical point of view, the study of susceptibility to social influence demands an integration of information derived from a number of specialized areas of psychology such as motivation, cognition, personality, learning and others. From a practical point of view, the study of susceptibility to social influence has profound implications for areas of influence such as psychotherapy, where the individual wishes to change, or "brain washing", where the individual wishes to resist change.

Specification of factors related to susceptibility to social influence is a major problem in this area. The nature of the communication and its general persuasiveness constitutes one factor. Another relates to the characteristics of the communicator. While both are important, they do not account for individual differences in communication acceptance. Under the same conditions, one person may modify his attitudes in the direction of the communication, a second may maintain his original attitude, and a third may move in a direction opposite to that advocated. It is apparent that personal characteristics need to be taken into account if adequate explanations are to be offered regarding susceptibility to social influence. Cognitive complexity is an individual difference dimension which appears to have relevance to susceptibility to social

influence. One reason for this is that differential reactions to a communication may be expected depending on the degree to which the individual is able to differentiate incoming information and integrate it with existing attitudes. A second reason is that differential reactions may be expected depending on the individual's orientation to the world around him. Some individuals are responsive to external influences as a guide to behavior and attitudes, while others rely chiefly on internal standards to guide behavior. The dimension of cognitive complexity takes both of these predispositions into account.

Another factor which has relevance to susceptibility to social influence is that of arousal. An increase in arousal is assumed to be reflected in an increase in autonomic reactivity as measured by physiological indicators. The propensity of an individual to become aroused, and his reactions to his feelings of arousal, have a bearing on his mode of response to the presentation of a communication. Persons who are physiologically reactive have an additional factor with which to contend under social influence attempts. Their increased arousal influences how a communication is perceived and how they respond to it. When a social influence situation inherently or intentionally increases arousal level, this variable becomes even more important. It seems likely that the desire or necessity to reduce arousal has a bearing on the reaction of individuals to a communication presentation. Some

individuals are able to tolerate a high level of arousal, but others find some means of reducing it. One method of doing so is to accept the content of the communication.

The primary purpose of the research to be reported below was to explore the relationship between measures of arousal and cognitive complexity, and to examine arousal reduction as a variable mediating communication acceptance. Since there are behavioral differences among complexity levels, the possibility exists that these are associated with differences in physiological reactivity. Further, since some individuals are less able to tolerate arousal than others, arousal reduction may be a variable mediating the cognitive complexity and susceptibility to social influence relationship.

A secondary purpose of this study was to explore the relationship between level of cognitive complexity, communication source, and susceptibility to social influence. The degree to which a subject attributes a communication to a respected and knowledgeable source has an influence on communication acceptance. However, differences in the subject's perception and evaluation of the source of communication are related to level of cognitive complexity.

In the first section of this chapter, the role of arousal as a mediating variable is reviewed in order to discuss its relevance to the present problem. Considering arousal as a mediating

variable also provides a basis for reinterpretation of social influence studies involving the cognitive complexity dimension. In the following section evidence is presented regarding the relation between arousal and social influence. An attempt is made to show that arousal reduction is a variable operating in these investigations. Finally, available evidence regarding the relation between cognitive complexity and susceptibility to social influence is presented. Reinterpretation in terms of arousal reduction as a mediating variable is offered.

Arousal as a Mediating Variable

The primary purpose of the research reported was to explore the relationship between arousal and cognitive complexity and to examine arousal reduction as a variable mediating communication acceptance. In order to explicate the relevance of arousal to susceptibility to social influence, and in turn the mitigating influence of cognitive complexity, the relation between arousal and other forms of behavior are briefly reviewed.

Theorists appear, generally, to be in agreement regarding the relation between arousal and performance. Hebb (1955), Bindra (1959), Malmo (1959), Fiske and Maddi (1961) and Duffy (1962) state that the relation follows the inverted U function. There is now considerable evidence to support the contention that there is an optimal level of arousal for efficient performance on a task. As arousal increases, performance improves, but beyond an optimum

there is a decrement in performance (Fuster, 1958; Burgess & Hokanson, 1964; Hokanson & Burgess, 1964; Harleston, Smith & Arey, 1965; Doerr & Hokanson, 1965; Wood & Hokanson, 1965; Bandura & Rosenthal, 1966; Wilson & Radloff, 1967).

The evidence regarding decreased efficiency at high levels of arousal in the tasks used in these studies implies a reduction in intellectual functioning. When social influence attempts are made under conditions of high arousal, subjects may find it difficult to bring their existing opinions to bear on the communication being presented and at the same time of evaluating it in terms of the motives and competence of the communicator. It is expected, therefore, that subjects are generally more susceptible to social influence attempts under aroused conditions.

The effects of arousal on the perception of the task and the situational context is of interest in considering how arousal may influence susceptibility to social influence attempts. Easterbrook (1959), in a review of studies involving the effect of arousal on cue utilization, proposed that emotional arousal acts consistently to reduce the range of cues that an organism uses, but that the reduction may have either an organizing or disorganizing effect on performance depending on whether the task demanded the use of many or few cues for greatest efficiency. Similarly, Walters and Parke (1964) have stated that an increase in arousal may alter perception such that individuals focus attention on relevant cues. Some

evidence is available to support this contention. Oltman (1964) found that accuracy on the Rod and Frame Test of field dependence improved when subjects were aroused by loud white noise. Oltman suggested that increased arousal led to a reduction in the range of cue utilization, making it easier for subjects to avoid the distracting effects of the surrounding tilted frame. In this study, arousal facilitated performance. Streufert, Suedfelt and Driver (1965) found that as information load increased in a game situation, the desire for information decreased and the ability to integrate available information also decreased. The necessity of handling large quantities of information in a competitive situation was arousing to subjects, and beyond the subject's optimal level additional information had a disorganizing effect on performance. These studies provide evidence that a narrowing of attention occurred under conditions of arousal and that when many cues were present some were excluded. A first step in social influence attempts is to bring about a narrowing of attention to cues contained in the communication and to exclude as many extraneous cues as possible. It is necessary for the individual to attend to information before he can react to it. Differences in how the individual reacts to information after he has attended to it will be considered later.

The relation between internal cues and environmental events offers a suggestion as to how particular reactions to social influence attempts come to be established. Several authors have pro-

posed that arousal is the product of an interaction between internal conditions and external cues (McClelland, 1955; Malmö, 1959; Duffy, 1963). Walters and Parke (1964) made the notion explicit by stating that internal cues associated with states of arousal may become conditioned to environmental cues. Some evidence is provided by Bandura and Rosenthal (1966) in their study of vicarious conditioning in which arousal was manipulated using drugs and threat of shock. Results showed that emotionality and vicarious conditioning were unrelated at low and moderate levels of arousal, positively correlated as arousal was further increased, and inversely related under conditions of strong physiological arousal. Thus a subject who was experiencing a moderately high degree of arousal was most likely to associate internal cues to environmental cues and subsequently to react to similar environmental events in accordance with that association. This experiment demonstrated that physiological reactions can become associated with contiguous environmental events. It suggests that if an individual is aroused when a social influence attempt is made, he is likely to be responsive to accompanying external cues.

The question arises as to whether arousal reduction has reinforcing properties. Fiske and Maddi (1961) proposed that negative affect is experienced when activation level differs markedly from normal level; positive affect being associated with shifts in activation toward normal level. It will be noted from this and

subsequent statements that theorists have used such terms as "normal", "customary", or "characteristic" in referring to the level of arousal at which the individual presumably feels most comfortable. Research designed to determine the degree of arousal at which an individual is most at ease has still to be done.

Hebb (1955) suggested that at low levels of arousal an increase in arousal is rewarding, while at high levels a decrease is rewarding. McClelland (1953) also proposed that changes in states of arousal toward the characteristic level of the individual are reinforcing. Hilgard (1963), in his discussion of motivation, noted that "affective change in the direction of positive affect is said to be the equivalent of drive reduction in reinforcement and to account for energetic as well as relaxing consummatory activity" (p. 267). These authors made the assumption that a reduced level of environmental stimulation results in a decrease in arousal while high levels of stimulation produce increased arousal. This position was supported by Leuba (1955), Lindsley (1957), Malmo (1959) and Duffy (1962), who contended that activation resulted from the amount of cortical bombardment by the Reticular Activating System (RAS) and the greater the cortical bombardment the higher the activation. The amount of cortical bombardment was conceived as being directly related to the amount of stimulation transmitted to the RAS, either by sense receptors or feedback from the cortex (Hebb, 1955; Duffy, 1962). Only a limited

amount of evidence is available to support this contention. Studies on boredom by Barmack (1939) and Geiwitz (1966) suggested that boredom was associated with reduced arousal.

Berlyne (1963) took an opposing view regarding the relationship between activation and stimulation. He contended that both high and low levels of stimulation resulted in an increase in arousal. Support for this formulation was provided by Davis (1959) who found that subjects in a restricted environment showed increased muscular and circulatory activity but decreased respiration as compared to subjects exposed to a dim light and the sound of a constant tone. Stern (1966), using a vigilance task, confirmed his hypothesis that subjects in a group receiving few signals were more aroused than subjects in a group receiving frequent signals.

Zuckerman, Levine and Biase (1964) measured arousal under three conditions of total and partial perceptual isolation over a period of three hours. Significant increases were found for all groups after one and one-half hours, with the total perceptual isolation situation producing the greatest effect. On the basis of such evidence, Berlyne's hypothesis regarding the reinforcing properties of arousal reduction took the following form: "When arousal stands above its possible minimum, we assume that there will be an aversive state and that anything that serves to bring it down toward its possible minimum will have reward value" (p. 317). Berlyne's hypothesis differs from those quoted previously in that he thought

only in terms of reducing arousal, not increasing it, to characteristic level. Thus, when the individual is not experiencing sufficient stimulation to maintain his characteristic level, arousal is increased. He attempts to reduce his arousal by actively seeking an increase in stimulation.

Empirical evidence unequivocally associating reduced stimulation with either high or low arousal is still lacking, but Berlyne's proposal that reduced stimulation creates an increase in arousal has gained acceptance. Walters and Parke (1964), Schultz (1965), and Schroder, Driver and Streufert (1967) assumed this position in their respective theories. The evidence available suggests a differential reaction depending on personal characteristics of the individual (Kubzansky, 1961; Zuckerman & Haber, 1965). Experimental results have also indicated that when arousal is experienced under reduced stimulation it is different in some respects to that induced by excessive or noxious stimulation (Davis, 1959; Schultz, 1965).

The relation between arousal and stimulation has relevance to the present discussion because if one accepts that reduced stimulation increases arousal level, then it is possible to reinterpret studies involving sensory deprivation and susceptibility to social influence in terms of arousal. The position taken in this paper is consistent with other theorists (Berlyne, 1963; Walters & Parke, 1964; Schultz, 1965) that reduced stimulation creates an increase

in arousal as reflected in an increase in autonomic reactivity.

The hypothesis reviewed (McClelland, 1953; Hebb, 1955; Fiske & Maddi, 1961; Hilgard, 1963 and Berlyne, 1963) which refer to the reinforcing properties of arousal reduction, are in agreement that a person experiencing increased arousal finds the condition aversive and seeks to reduce his discomfort. The kind of behavior he may engage in to accomplish this end will be considered.

A subject in a task situation who is aroused and wishes to escape from his feelings of discomfort may find he is not functioning sufficiently well to reduce his arousal by successfully coping with the task. Under these circumstances some other means of reducing arousal and accompanying discomfort will be found. Any response the subject makes which is followed by a reduction in arousal will be rewarded by that reduction, and is likely to be elicited again under similar circumstances. The subject may decide the task is not worth his best effort because it is foolish, that it is impossibly difficult and practically no one could do it, or he may use his arousal symptoms as an indication that he is not feeling well and excuse his performance on those grounds. Under social influence attempts some individuals may find that conformity or submission reduces arousal level, in which case a conforming response is reinforced. Other individuals may find other ways of reducing arousal such as ignoring disquieting information, rationalizing, counterarguing, discrediting the source, and so on, in which case

it will be these responses which are reinforced by arousal reduction.

A point often implied in experimental designs, but rarely made explicit, is that if arousal is to be reduced the responses made must have relevance to the source of the arousal. If arousal is caused by a noxious stimulus or threat of one, escape, avoidance or mitigation of noxity are responses which reduce arousal. If arousal is caused by perceptual or sensory deprivation, stimulation of any kind reduces arousal. If arousal is caused by ego-involvement, a response which provides reassurance, excuses failure, or allows escape from the ego-involving situation reduces arousal. If arousal is caused by social pressures, conformity, counterarguing, discrediting the source, and other similar responses reduce that arousal, and for this to be possible the response must have relevance to the source of arousal. It seems likely that habits of responding in particular kinds of situations are built up in this way.

It is recognized that not all individuals have a strong need to reduce arousal when it is experienced. Some are able to tolerate arousal and continue to function at least reasonably well. Possibly the cognitions accompanying the aroused state are such as to make it tolerable. For example, if the individual could think to himself, "I am aroused, but it will pass," he may be less likely to seek out responses which would reduce it immediately.

In attempting to predict how an individual is likely to respond in a given situation it is necessary to take into consideration individual differences. The cognitive complexity dimension is one method of categorizing individuals. This dimension may be partly determined by habit patterns which the individual has evolved to reduce arousal under varying circumstances. The question as to whether arousal reduction is reinforcing cannot be answered without taking into consideration information regarding characteristics of the individual and situational variables. Arousal reduction is conceived as being but one possible influence on behavior. Others relate to the nature of contiguous events, cognitions regarding these events, and established habits of responding.

It is assumed that arousal functions to facilitate susceptibility to social influence provided that the social influence procedures are in some way relevant to the source of arousal such that acceptance has the potential to reduce arousal level. However, since some subjects have established habit patterns of reducing arousal in other ways, or are simply able to tolerate stress, not all will follow this pattern. Evidence indicating that there are differential reactions depending on personal characteristics and on situational factors will be reviewed subsequently.

The Relation between Arousal and Social Influence

It has been demonstrated that there are wide individual

differences in the amount of arousal experienced by subjects under similar conditions, and that consistent individual differences are related to both arousal and attitude change. Buckhout (1966) explored the relationship between changes in heart rate and attitude change. Subjects were obliged to choose between two statements, both of which were inconsistent with initial attitude, and to verbalize their choice. Buckhout found that subjects whose net attitude change scores were in the direction of verbal reinforcement were significantly higher in initial base-line heart rate and degree of heart rate increase than anti-conformers. These subjects also showed a significant decrease in heart rate during the interview, indicating arousal reduction. Anti-conformers were significantly lower on all heart rate measures. Non-shifters were only slightly lower on heart rate measures than conformers. Heart rate decrease was significant for conformers and non-shifters, but not for anti-conformers.

Buckhout's results suggest that arousal was created in subjects by the necessity of verbalizing statements counter to their initial attitudes and by being verbally reinforced for their choices. All subjects, except anti-conformers, who experienced little arousal, found a means of decreasing arousal. For some conformity was used, whereas for non-shifters some other cognitive device was apparently found.

Back, Bogdonoff, Shaw and Klein (1963) sampled blood from

subjects engaged in a modification of the Asch experiment . Free fatty acid levels were used as a measure of arousal. Results showed that decrease in free fatty acid during the experiment and amount of conformity were positively correlated at a significant level. Subjects having the highest pre-experimental arousal showed the greatest degree of conformity, suggesting that for these subjects conformity was arousal reducing.

McNulty and Walters (1962) investigated the relationship between manipulated conditions of arousal, measures of muscle tension and attitude change. Degrees of arousal were induced using ego-involvement and argument with confederates of the experimenter who expressed opinions contrary to predetermined strongly held opinions of the subject. Changes of opinion in the direction specified by the confederate were reinforced by the latter's verbal and gestural approval. These investigators found that subjects in the most arousing condition (ego-involvement plus argument) produced the most emotionally reactive physiological records, and also changed their attitudes more than subjects in other conditions. The authors concluded that the effectiveness of the social influence procedures used was a function of arousal level.

Darley (1966) tested the prediction that increased fear would produce increased conformity. Using an Asch situation, Darley found that female students threatened by future electric shock conformed more than no-threat controls. In addition, threatened

subjects who believed that other members of the group were similarly threatened conformed more than subjects who believed other members of the group were not to receive shock.

In the investigations by Buckhout and Back et al pre-experimental arousal was measured and no attempt to induce different levels of arousal was attempted. Initial arousal level relates to individual differences in autonomic reactivity of subjects facing a testing situation. The reassurance gained from conforming to the group or from accepting verbal reinforcements as an indication that one was performing satisfactorily may have produced the reduction in arousal level.

In the studies by McNulty and Walters and by Darley the state of arousal was manipulated by the experimental conditions. The results of these studies indicated that conforming to verbal reinforcement or to the group was greatest under high arousal. No information regarding reduction in arousal is available, but it seems reasonable that arousal reduction was a factor in these studies as well. A point considered to be important, but not mentioned by these researchers, is that the arousal manipulations and the content of conformity were in some way cognitively related. In McNulty and Walters' study subjects conformed to views expressed by confederates in an argument after ego-involving instructions. In the study by Darley, shock was threatened in an Asch conformity situation and hence responses made were influenced by

that threat. Thus the act of conforming had the potential to reduce arousal.

One study is available which may illustrate that when the source of arousal is unrelated to the content of a communication, subjects are not influenced by that communication. Rehill (1966) predicted that the attention of a highly aroused subject tends to be restricted to the communication and distraction has little effect. Since distraction interferes with the subject's ability to counterargue effectively, he is less susceptible to persuasion. Rehill manipulated subjects to low, medium or high arousal on a task involving success or failure relative to others in a group situation. A sound effects distraction tape was played while subjects read an essay expressing an attitude on the use of TV in schools contrary to their own. A test of memory for the contents of the communication and of the distraction tape was taken as an indication of concentration. High arousal subjects remembered significantly more of the communication and less of the distraction tape than the other two groups, indicating greater concentration on the communication. Subjects in the high arousal condition were significantly more aroused as measured by heart rate than subjects in the low or medium arousal conditions. Furthermore, as predicted, subjects in the high arousal group evidenced significantly less attitude change than other subjects.

An interpretation of Rehill's study within the context of

arousal reduction is possible. Heart rate increase for subjects in low and medium arousal conditions was slight. In fact, it could be accounted for on the basis of extra stimulation produced by the distraction tape and by the fact that subjects were informed that they were taking part in a study of physiological changes occurring during an intelligence test. Under these conditions acceptance might well depend on how ego-involved the subject happened to be in his opinion on the use of TV in schools, and the persuasiveness of the communication itself. Highly aroused subjects, on the other hand, concentrated on the communication and, perhaps in an attempt to redeem themselves after failure on the psychomotor test, focused their attention on remembering as much as possible. Since the content of the communication was in no way related to the source of arousal (failure on an ego-involving task) there would be little incentive to internalize the communication. The experimental design did not make it possible for aroused subjects to reduce arousal through communication acceptance or any other means. For these subjects arousal reduction would depend on results of the memory task, or the revelation that deception had been used.

One study offers evidence that reinforcement which is relevant to the state of arousal is most effective. Dorwart, Ezerman, Lewis and Rosenham (1965) found that socially deprived boys maximized task responses when they were socially reinforced. Boys who had not been socially deprived or were nonsocially reinforced did not res-

pond as efficiently.

A number of investigators have studied the influence of arousal on susceptibility to social influence by inducing fear in subjects. Results of experiments in this area are inconsistent. Janis and Feshbach (1953) found that a high-threat form of lecture on dental hygiene was less successful in producing attitude change than a low-threat form. Janis and Feshbach (1954) later hypothesized that under conditions where the feared outcome is perceived as being escapable or when the communication contains recommendations which will avert the threat, high fear would facilitate attitude change.

Chu (1966) using school children as subjects, investigated the relation between a fear-arousing communication regarding round worms and acceptance of recommendations to take a proffered drug. High arousal was most effective in having a recommendation accepted when the drug was described as being highly effective. When the solution to the fear-arousing communication was not presented as efficacious, subjects tended to minimize the threat. Dabbs and Leventhal (1966), using college students as subjects, found a positive linear relation between acceptance of a recommendation as measured by behavioral compliance (obtaining a tetanus shot) and level of fear arousal. Manipulations regarding the effectiveness of the recommendation did not influence acceptance in this study.

Leventhal and Singer (1966) exposed visitors to a state

exposition to fear communications and recommendations on dental hygiene. Results showed that the higher the level of fear, the greater the acceptance of recommendations. Fear reactions in the high-fear condition were decreased by the presence of recommendations, particularly if they followed the communication rather than preceding or being intermixed with it. However, this reduction in fear did not increase intention to follow the recommendations.

The studies cited have provided inconsistent evidence regarding the proposal of Janis and Feshbach that high fear, together with an efficacious solution, promotes attitude change. However, these studies vary in the sophistication of subjects, the experimental conditions, and the topic used to induce fear. College students in the Dabbs and Leventhal study may have considered the threat of tetanus sufficiently serious that even a shot not one hundred percent effective was better than no protection at all. In the Leventhal and Singer study subjects were members of the general population who visited a 1963 exposition in New York. Since the advent of television most people are likely familiar with recommended dental hygiene practices. Even though the films were disturbing to these subjects, the familiar recommendations at the end could have caused relief without influencing acceptance. These subjects were already either following or not following these simple rules without ill effects. Chu's study with children dealt with an unsophisticated group who were unlikely to have any pre-

conceived ideas on the subject of round worms, hence they were influenced by the efficacy of recommendations. These studies offer neither support for nor disproof of an arousal reduction hypothesis, but rather emphasize the need for greater control in studies of this kind.

DeWolfe and Governale (1964) investigated the effects of high-fear conditions on attitude change among student nurses over a six week period. Results obtained from subjects who were working in a TB ward, and hence were threatened by the possibility of contracting the disease, indicated that the higher the initial fear of TB the greater the favorable attitude change regarding the nurse-patient relationship. High-fear facilitated attitude change in the experimental group but not in the control group. DeWolfe and Governale attributed their results to the fact that there was a concurrent decrease in fear in the experimental group, in which the attitude change took place as a result of association with experienced and confident nurses.

This investigation was a more direct test of the arousal reduction hypothesis than the fear-arousing studies mentioned previously. In this case, arousal was the result of initial attitudes toward TB and daily exposure to the disease. Attitude change was not measured in terms of accepting some recommendation such as having frequent X-rays, but in terms of change in the subject's feelings toward patients having the feared disease. This is the kind

of change that would be expected from the arousal reduction hypothesis, as subjects would be strongly motivated to modify their attitudes toward the patients in their care.

Cognitive Complexity, Social Influence and Arousal

Harvey, Hunt and Schroder (1961) have formulated a comprehensive theory of personality organization in which cognitive, environmental and behavioral complexity are the central dimensions. According to the theory, conceptual structure determines the kind and diversity of information a person is capable of generating about his environment and the number of different ways he can organize and integrate that information. That is, conceptual structure determines his ability to make differentiations among stimuli which are alike in some respects but different in others. Conceptual structure also determines how the individual deals with perceived information; that is, his ability to integrate conflicting information and subsume it under superordinate rules.

These authors posit that the behavioral reactions of individuals functioning at four specified levels of conceptual complexity, ranging from concrete at the lowest level to abstract at the highest, differ in predictable ways in accordance with the complexity of the environment. They assume stages of transition between systems and hold that development may be arrested at some point along the continuum because of unfavorable environmental conditions. The characteristics of each system which have relevance to social

influence will be briefly mentioned.

In System I thinking is concrete. The individual is able to categorize stimuli into dimensions, but organizational rules for establishing relationships among dimensions are lacking. Ideas are accepted from powerful figures without question. Behavior is characterized by greater sensitivity to limits: categories tend to be bipolar--right-wrong, good-bad. At this level individuals are generally not open to potentially conflicting information. There is a greater submissiveness to external control, but under conditions of conflict the individual may switch to the opposite end of his bipolar concept or resolve the conflict by excluding some of the available information from consideration.

Individuals functioning at System II are capable of finer discriminations than in System I, but thinking still tends to be categorical. More differentiation has been developed but there is a tendency for one dimension to be applied in one situation and another dimension in a different situation. Integration is lacking. System II individuals are characterized by negative independence involving a lessening of the importance of external control. They tend to be resistant to influence from outside sources, but in an unstructured situation they are readily influenced by any source.

System III individuals have developed superordinate rules which can be used to make comparisons and evaluations. They are

capable of holding alternative views of themselves, of events, and of others simultaneously with a minimum of concern for ambiguity. Other people's intentions and wishes are taken into account. System III allows for a more objective view of the environment, but this view is largely determined by the attitude of significant others. Other people tend to be evaluated in terms of their attractiveness, and System III individuals are concerned that they be accepted by those who attract them.

At System IV the individual develops a high degree of tolerance for anxiety and resistance to stress. More abstract functioning is based on a conceptual structure that has been open to a variety of conflicting forms of subject-object relatedness that have been progressively integrated during development. The System IV individual is sensitive to situational nuances but his judgments tend to be based on internal standards. He is likely to be influenced only when he considers the source of a communication more competent than himself or under conditions of uncertainty and ambiguity. He is continually modifying his internal organization in the light of new experiences.

For all systems, functioning is believed to be less than optimal when incoming information is minimal or has little impact, and when the individual is in an aroused state. Some of the studies involving cognitive complexity and social influence will be reviewed in terms of arousal as a mediating variable.

Suedfeld (1964a) confined subjects having neutral attitudes to a restricted environment for a period of from 22 to 24 hours. Subjects were then presented with a strong pro-Turkey argument followed by a weaker counter-argument. Suedfeld predicted that reduced environmental complexity would lead to a reduction in response complexity which would result in a failure to integrate the opposing arguments. Subjects consequently would tend to completely accept or completely reject the advocated communication. This effect, measured in terms of net attitude change, was expected to be largest for the concrete and smallest for the more abstract subjects. As predicted, Suedfeld found that attitude change occurred in concrete subjects but to a lesser degree in abstract subjects, and in the deprived but not in the control group.

Suedfeld was interested in the environmental complexity dimension and no physiological measures were taken. The possibility exists that isolation increased arousal level which in turn made the presentation of a communication reinforcing simply because it represented stimulation and hence reduced arousal. Some evidence is available to support the suggestion that there is a differential reaction in a restricted environment on the part of concrete and abstract subjects.

Harvey, Hunt and Schroder assumed that field-independence reflected a higher degree of articulation between oneself and the environment and hence a higher level of abstractness than field-

dependence. Shmavonian (1964) confined subjects to two hours of sensory deprivation. He found that field-dependent subjects became more aroused during isolation, while the physiological indicant of arousal in field-independent subjects showed a slight decrease. Superficially this is contrary to Suedfeld's (1964b) finding that abstract subjects reported the deprivation experience as being significantly more unpleasant than concrete subjects. The findings of Shmavonian and of Suedfeld suggest that cognitive reactions of unpleasantness are not necessarily related to physiological arousal. They also offered some support to Harvey, Hunt and Schroder's contention that abstract subjects have a high tolerance for stress. Abstract subjects may find the experience unpleasant but this feeling is not reflected in physiological arousal.

A reinterpretation of Suedfeld's findings in terms of arousal is possible. Concrete subjects were aroused by the sensory deprivation experience and hence functioned less efficiently than controls. When the communication was presented it reduced arousal simply because it represented stimulation. Since, according to theory, concrete subjects are submissive to external control and do not differentiate the stimulus, they would tend to accept the communication without conflict. There was no significant difference in amount of attitude change of abstract subjects in the deprived and control conditions. Apparently abstract subjects were capable of evaluating the communication in the light of their own knowledge

and not be unduly influenced. Since abstract subjects, according to theory, have a high need for stimulation and informational input, this finding seems inconsistent. One would expect the presentation of a communication in a restricted environment to have positive valence. However, since their tolerance for stress is believed to be high there might be little arousal, and hence arousal-reduction was not a factor.

Hewitt (1966) confined subjects for four hours and presented them with a communication aimed at improving their self-evaluation. He found that concrete subjects were significantly more influenced in the deprived than in the nondeprived condition, while abstract subjects reacted similarly under both conditions. The reinterpretation offered of Suedfeld's study applies equally well to this investigation.

Suedfeld and Vernon (1966) confined conceptually complex and simple subjects to a restricted environment. After 24 hours subjects were asked to evaluate the meaning of two-sided communications. If the subject responded in the pro direction he was rewarded by the presentation of the next passage; otherwise the question was repeated. The researchers predicted that abstract subjects would show greater compliance but less internalization in the deprived condition than in the nonconfined condition. Concrete subjects were expected to show both more compliance and more internalization in the deprived than in the nonconfined condition.

The findings were only partly in accord with predictions. Abstract subjects showed more compliance in the deprived condition than in the control condition, but concrete subjects complied no more in the deprived than in the nondeprived condition. With reference to internalization, greater attitude change was found among concrete subjects than abstract subjects, but no difference in groups existed in the nonconfined condition.

A reinterpretation of Suedfeld and Vernon's results is also possible. With respect to compliance, concrete subjects were likely to accept instructions literally and not be open to change. Since only pro answers were accepted as "correct" even though the passage was two-sided, this inconsistency would create problems for concrete subjects. They may take longer to realize what was being reinforced by the experimenter. In the case of more flexible abstract subjects, the need for stimulation in the deprived condition would function to alert subjects as to the best way of obtaining new information. In the non-deprived condition, when the need for stimulation was absent, abstract subjects reacted in a way similar to concrete subjects. Regarding internalization, the explanation offered of Suedfeld's findings is applicable to this investigation as well.

Streufert (1966) found the System I subjects did not change their attitudes in response to varying interaction distance conditions while all higher systems were influenced. Similarly,

Janicki (1964) found, as predicted, that System I subjects were less influenced by the judgment of another person in a modified autokinetic situation than were more abstract subjects. In this study, task ambiguity was maximized. Schroder, Driver and Streufert (1967) explained the differences in susceptibility to social influence of concrete subjects under deprivation conditions as compared to perceptual conflict or situational differences in terms of saliency. Since deprivation made the discrepant information highly salient, the communication tended to be adopted in a categorical manner. They claimed that under conditions of perceptual conflict or situational differences, the new information was not as salient as existing opinions and hence was rejected.

According to the formulation advanced here regarding arousal reduction, concrete subjects could ignore interaction distance in Streufert's study because they were not aroused and were free to react in their customary manner of ignoring information which was not necessary for the maintenance of preconceived ideas. In Janicki's perceptual study, the source of arousal was the discrepancy between the subject's perception and that of his partner. In a highly ambiguous task, the opinion of an unknown partner could readily be categorically rejected. The subject's own judgment may be considered as good as his partner's. Hence, conformity would not be expected of concrete subjects. More abstract subjects would be more likely to entertain the possibility that they could

be wrong.

Crutchfield (1955), using a modified Asch technique, investigated the effects of group pressure on conformity. Subjects scoring high on the F scale conformed more than other subjects. Schroder, Driver and Streufert ascribed these results to the saliency of the group response as in the deprivation studies. However, this experiment does not seem to differ in kind from Janicki's except for the task ambiguity factor and the number of subjects in the group. In Crutchfield's study the stimuli could be clearly perceived. Hence, when the response of group members was different from that of the subject, conflict and arousal ensued. In this instance outright rejection of differing opinions could be more difficult because of lack of ambiguity in the task itself. The alternative for System I subjects is complete reversal, which would mean acceptance of the prevailing opinion.

The Present Study

The primary purpose of the present study was to explore the relationship between measures of heart rate, as an indicator of autonomic reactivity, and cognitive complexity, and to examine arousal reduction as a variable mediating communication acceptance. It is proposed that arousal and arousal reduction have the potential for clarifying issues in the area of susceptibility to social influence. While it is recognized that autonomic reactivity is not the only mediating variable of importance, it is proposed that if

arousal is manipulated or inherent in the experimental situation, communications should have relevance to the source of arousal to make arousal reduction a possibility. If communications are not relevant to arousal source, arousal is likely to be a barrier to communication acceptance (Rehill, 1966). When arousal is not present, other factors such as source credibility, general persuasiveness of the communication, and learned response patterns play a more predominant role.

Walters and Parke (1964) have argued cogently for the mediation of social influence through arousal, and substantial empirical support is accruing to reinforce this argument. It has been demonstrated that there are wide individual differences in the amount of autonomic reactivity experienced by subjects under similar conditions, and that consistent individual differences are related to both arousal and attitude change (Buckhout, 1966; Back, Bogdonoff, Shaw and Klein, 1963). Since Harvey, Hunt and Schroder (1961) maintain that abstract subjects have a greater tolerance for stress than concrete subjects, autonomic reactivity may be mediating the relationship between cognitive complexity and attitude change.

One purpose of the present study was to examine physiological reactions of subjects varying in cognitive complexity under conditions of arousal. The relationship between a number of measures of heart rate and level of cognitive complexity was investigated, as

well as the relationship between arousal reduction and communication acceptance.

A secondary purpose of the research reported was to explore the relationship between communication source, level of cognitive complexity, and susceptibility to social influence. Harvey, Hunt and Schroder maintained that differences in susceptibility to social influence occur in the four conceptual system levels according to the nature of the communicator. System I subjects are influenced by communications originating with an authority symbolic of power. System II subjects are influenced by any source in an unstructured situation, but are highly resistant to influences under other conditions. System III subjects are influenced by a source which they find attractive. System IV subjects are influenced by a source considered to be competent. These predictions regarding the relationship between communication acceptance, communicator characteristics and level of cognitive complexity have not been investigated directly. In the present study, competence and attractiveness were combined under the term "valued". All communications were attributed to a source of high authority, but the degree to which the source was ascribed competent or attractive traits was varied. The task used was a highly unstructured one under arousing instructions. Given these conditions it was expected that under conditions of arousal both Systems I and II would be influenced by a high-authority source whether valued or

somewhat devalued. System I subjects were expected to accept either communication because of the authority position of the communicator, while System II subjects were expected to accept either communication because of a need for guidance in an ambiguous situation. Systems III and IV were expected to be influenced more by the valued source because of ability to maintain an evaluative attitude under arousing conditions as stated by the theory. Under neutral conditions of arousal, all subjects were expected to maintain an evaluative attitude, and hence not differ in communication acceptance as a consequence of communicator characteristics.

In the present study, arousal was induced by giving ego-involving instructions to subjects whose test scores indicated conceptual complexity at the four system levels. Susceptibility to social influence was measured in terms of acceptance of a communication which was related to the source of arousal; specifically, feedback regarding performance on an ego-involving task. Autonomic reactivity, as measured by heart rate, of subjects varying in cognitive complexity under neutral or aroused conditions was measured. The relationship between a number of measures of heart rate and level of cognitive complexity was investigated, as well as the relationship between arousal reduction and communication acceptance. Since the experimental design involved an attempt to bring about a change in self-concept, the relationship between self concept and heart rate, and between change in self-evaluation and heart rate

were also explored. Two kinds of communication and a no-communication control were used in order to evaluate the influence of source credibility under conditions of arousal.

METHOD

Subjects and Selection

From a pool of 340 male students, primarily from introductory psychology classes, 30 subjects whose scores indicated functioning at each of the four conceptual systems were selected for further testing. The Individual Topical Inventory (Tuckman, 1966) was used as the basis of selection. The test was administered to students in small groups under the guise that norms were being collected for a new psychological test. Subjects participated in testing as part of course requirements. The distribution of subjects on this test is shown in Table 1.

TABLE 1

Distribution of Students on Individual Topical Inventory

Subjects	Decile	No. of Ss	Percent	Totals
I	10th	6	1.76	9.41
	9th	12	3.53	
	8th	14	4.12	
II	10th	24	7.06	11.18
	9th	14	4.12	
III	10th	51	15.00	22.05
	9th	23	6.76	
	8th	1	0.29	
IV	10th	70	20.59	27.94
	9th	25	7.35	
Mixed (Ss in 9th or 10th decile in more than one system)		55		16.18
No system predominant (8th decile and lower on all systems)		45		13.23
Total		340		99.99

For Systems III and IV it was possible to select subjects with scores at the 10th decile. It was necessary to lower standards for subject selection for Systems I and II. Appendix A contains the test and scoring information.

Selected subjects were contacted by telephone. They were told that their names were drawn in a random sample and were asked to participate in an experiment. Participation in six experiments was required for course credit. Some subjects had already earned all necessary credits, but were persuaded to take part anyway. Only seven such subjects refused to participate on the grounds of pressure of work.

Apparatus and Materials

The Index of Adjustment and Values (IAV) (Bills, Vance & McLean, 1951) was used to measure the self concept of subjects. This test requires the subject to rate how much of the time the 49 listed traits are characteristic of him. In its original form the test measures the individual's self concept, his self-acceptance, and the discrepancy between his concept of self and his concept of his ideal self. In the present study only the concept of self was measured. Bills (1952) has reported split-half reliability coefficients of .91 and .88 and test-retest reliability coefficients over a period of six weeks of .83 to .87. According to Wylie (1961) the IAV is the most useful measure of the self concept for research purposes because more information is available on norms, reliability, and validity than on any other measure of the self concept.

The test was administered before the experiment, and selected items were administered a second time following presentation of the communication. Both of these, along with Bill's complete test and scoring procedure are contained in Appendix B.

The first six cards from the Bender Gestalt Test were used as the task upon which a subsequent evaluation was ostensibly based. Designs of varying complexity are printed on these cards. The subject is required to reproduce these designs. The task was chosen because it would make a personal evaluation believable on the one hand, and would make neutral instructions workable on the other.

The degree of confidence subjects had in the source of the communication was measured by asking them to rate their reactions on an 11-point scale. In an attempt to discover if conceptual systems differed with respect to the most salient characteristic associated with the source of the communication, subjects were asked to select one characteristic from a list of six provided. These measures are contained in Appendix C.

Heart rate was used as an objective indicator of arousal. Lacey, Bateman and Van Lehn (1953) showed that individuals respond to different kinds of stressful conditions with a characteristic pattern of autonomic activity, but that the nature of the pattern varies from individual to individual. Lacey and Lacey (1958) found low intercorrelations among autonomic responses. One implication of Lacey's work was that research based on one autonomic response variable was suspect since a subject may rate below average on one

measure such as skin conductance, but well above average heart rate. Hence different measures have yielded different results under the same conditions. However, Lacey was focusing on intra-individual differences in autonomic responses and not on quantitative changes in autonomic reactivity from one situation to another. Even though a subject is below average on a given autonomic measure, he is likely to experience a change in that measure under a stressful condition. Schnore (1959) found that while subjects exhibited idiosyncratic patterns of activation which were highly stereotyped during qualitatively and quantitatively different stimulus situations, the differences between low arousal and high arousal were significant for all variables. He further found that heart rate was among those physiological measures which reliably differentiated between stimulus conditions.

Heart rate was measured continuously using a Beckman-Offner Type R Dynograph. Standard ekg electrodes were attached to the chest, one above and to the right of the heart, one below and to the left of the heart, and a ground in the central, lower region of the rib cage.

Procedure

One hundred and twenty subjects were run in groups of from two to four, with five subjects in each condition. Subjects first completed the Index of Adjustment of Values, and then moved to the experimental room where they were seated in cubicles which restricted their range of observation. After electrodes were attached to

each subject to measure heart rate, subjects were asked to relax for four minutes while a pre-experimental basal heart rate level was recorded. They were then given the Bender Gestalt Test.

The instructions preceding presentation of the Bender Gestalt Test were used to manipulate arousal level. Half the subjects were given ego-involving instructions designed to increase arousal level, and the other half were given neutral instructions. In the aroused condition, subjects were told that the task they were to do was widely used in clinic settings to assess emotional stability, personality characteristics, and sexual adjustment. They were also told that speed was one determining factor and that they should work as quickly as possible. For the neutral condition subjects were told that it was a simple perceptual task and that they were to reproduce the designs printed on the cards. They were told to work at their normal rate of speed. The exact wording of these instructions may be found in Appendix D.

Upon completion of the task subjects were presented with a personality assessment, ostensibly derived from their performance on the design-reproducing task. The assessment was in the form of ratings on nine personality-related adjectives. All subjects received identical ratings. The accompanying explanation took two forms: in one the assessment procedure was attributed to a high authority, highly valued source, in the other it was attributed to a high authority, somewhat devalued source. In order to attribute evaluations to a source about which subjects would have no previous

attitude, a fictitious psychologist, Professor Schiller, was devised. His formal status was described in the same terms in both communications. However, in the valued communication his work was positively evaluated, while the devalued communication stated that his work had been criticized by many psychologists. The ratings and the accompanying explanation for both the valued and devalued conditions are contained in Appendix D. Subjects in the control condition received no communication until the end of the experiment.

Following presentation of the communication, subjects were asked to complete selected items from the Index of Adjustment and Values, to rate their degree of confidence in the source of the communication, and to evaluate the source in terms of the most salient characteristic.

The study provided a 4 x 2 x 3 factorial design with four system levels, two levels of arousal, and three kinds of communication or no communication.

RESULTS

The findings of this study are presented under four major headings: (1) the relationship between measures of arousal and cognitive complexity; (2) arousal reduction as a variable mediating communication acceptance; (3) the relationship between communication source, level of cognitive complexity, and susceptibility to social influence; and (4) other variables associated with cognitive complexity and change in self-evaluation.

Analyses of variance were performed on all variables and in addition a correlational analysis was carried out in order to clarify the findings from the analyses of variance. Correlations were also computed to determine the relationship of several variables to change in self-evaluation.

The dependent variables involved in this study were self-evaluation, confidence in the source of the communication, description of the source of the communication, time taken to complete the experimental task and to look at the communication, and heart rate measures.

The main dependent variable of this study was self-evaluation. Scores from the first administration of the test were used in the correlational analysis. The major variable, however, consisted of the difference between scores on the pre-experimental administration of the test and the post-communication administration over nine items. The change score was a ratio of the sum of differences

in self-evaluation ratings from pre- to post-communication administrations to the number of items on which change was possible. When the subject's first rating of himself and the rating on the communication were the same, no change was expected; hence this was scored zero. When the subject's second self-evaluation moved in the direction of the communication, the change was scored plus, and when the subject's second self-evaluation moved away from the communication, it was scored minus. The final score represented a ratio of the sum of all changes to the number of items on which change could occur, that is, the number of items on which the communication differed from the original self-evaluation. To illustrate:

<u>Subject's First Self-Evaluation</u>	<u>Rating on Communication</u>	<u>Subject's Second Self-Evaluation</u>	<u>Score</u>
5	5	5	0
3	5	4	+1
4	5	3	-1

Subjects ranged from 0 to 5 on the number of items on which their initial self-evaluation was the same as the communication. The average for all subjects was less than 3.

Variables concerned with the source of the communication included confidence in and description of the source of the communication. Confidence ratings were obtained by having subjects rate their confidence in the validity of the test, upon which a personal evaluation was ostensibly based, on an 11-point scale. A description of the source was obtained by asking subjects to

select one adjective from six provided which in their opinion best described Professor Schiller. The list contained characteristics which, according to theory, influence communication acceptance in the four systems.

Time taken to complete the experimental task and to look at the communication were counted in seconds. The amount of time that subjects took to complete the task was referred to as "task time". The length of time spent looking at the communication was referred to as "look time".

Measures of heart rate included a base rate, rate during task execution, and a second rest period. All measures were based on the mean of the number of beats in ten second intervals for the given period. Pre-experimental base rate, referred to as rest 1, represented the mean of ten second intervals for the last three minutes of the initial four minute resting period. The rate for task was the mean of ten second intervals from the beginning of the design-reproducing task until the subject had completed all six designs. Heart rate for rest 2 represented the period immediately following communication presentation to the beginning of self-evaluation. The length of time for task and rest 2 was variable as subjects differed in the time required to complete the task and in the time spent looking at the communication.

Heart rate measures also included change in rate from one period to another. The difference in heart rate for ten second

intervals between task and rest 1 was referred to as heart rate increase. This was a measure of the amount of increase in autonomic reactivity following task instructions. The difference in heart rate for ten second intervals between task and rest 2 was referred to as heart rate decrease. This was a measure of the amount of reduction in heart rate after subjects received a communication regarding their task performance. The difference in heart rate for ten second intervals between rest 2 and rest 1 was referred to as heart rate recovery. This was a measure of the degree to which subjects returned to pre-experimental base rate after receiving a communication.

The Relationship between Arousal and Cognitive Complexity

Analysis of variance* based on heart rate increase showed a significant difference between the aroused and neutral conditions ($F = 18.156$, $df = 1/96$, $p < .001$). Means for heart rate increase for arousal conditions are shown in Table 2. This difference indicates that the arousal manipulation was effective in increasing autonomic reactivity. No other sources were significant in this analysis.

In order to determine whether there were differences among systems in heart rates for the three periods measured, or

*All summaries of analysis of variance are contained in Appendix E.

TABLE 2

Means for Heart Rate Increase (Task less Rest 1)
for Arousal Conditions

Arousal	Mean Heart Rate Increase
Aroused	1.53
Neutral	0.76
All Ss	1.14

associations between change in self-evaluation and heart rates for any of the systems, several analyses were carried out.

Analysis of variance based on mean heart rate for rest 1, task, and rest 2 produced no significant F values. Table 3 lists the mean rates for each system. The sequence of heart rate means from lowest to highest was the same for all periods following the order Systems I, III, II and IV. However, only rest 2 produced any significant difference in means. For rest 2 System IV differed significantly from System I at .05 and approached significance from System III at .10 by Duncan's new multiple range test (Edwards, 1963).

Correlations between change in self-evaluation and rest 1 heart rate are shown in Table 3. Correlations for Systems I and III differed from those for Systems II and IV at the .01 level. Since the relationships were positive, this finding suggested that higher pre-experimental heart rate levels may be associated with greater susceptibility to influence for Systems I and III.

TABLE 3

Mean Heart Rates for Rest 1, Task, and Rest 2, and Correlations between Change in Self-Evaluation and Rest 1 Heart Rates for System Levels.

System	Rest 1	Task	Rest 2	Change in Self-Evaluation and Rest 1 Heart Rate r
I	12.8	13.9	13.0 ^a	0.257*
II	13.0	14.2	13.5 ^{ab}	0.030
III	12.8	14.0	13.1 ^{ab}	0.334*
IV	13.5	14.6	14.0 ^b	0.059
All Ss	13.0	14.2	13.4	0.126

Note: Cells containing the same subscript are not significantly different from each other at the .05 level by Duncan's new multiple range test.

*Differ from Systems II and IV at .01.

Among Systems II and IV, no such relationship existed in spite of a higher mean heart rate. These results offer a tentative indication that there was a differential response depending on level of cognitive complexity, but are limited by the fact that none of the correlations per se achieved significance.

Correlations between change in self-evaluation and heart rate increase (task less rest 1) achieved significance only for System III and only System III produced an inverse relationship ($r = -0.387$, $p = .05$). There was no appreciable change when the

effects of self concept were partialled out ($r = -0.401$, $p = .05$). This finding indicated that for System III a high increase in autonomic reactivity was associated with less change in self-evaluation. This association was also reflected in mean change in self-evaluation under aroused and neutral conditions. System III subjects showed less change in self-evaluation in the aroused condition ($M = 0.294$) than in the neutral condition ($M = 0.312$), even though the former was still relatively high compared to other groups.

Arousal Reduction as a Variable Mediating Communication Acceptance

Analysis of variance based on change in self-evaluation indicated a significant difference among systems ($F = 3.187$, $df = 3/96$, $p < .05$). The mean change scores for the four systems are presented in Table 4. Subjects in System III produced significantly more changes in self-evaluation than subjects in the other three systems.

Several measures of arousal reduction were available. One was heart rate decrease (task less rest 2). This measure included the amount of autonomic reaction as a consequence of task instructions. Heart rate decrease provided an indication of the degree to which heart rate changed following the presentation of a communication. A second measure of arousal reduction was heart rate recovery (rest 2 less rest 1). This measure eliminated the amount of increase in heart rate attributable to arousal instructions and

TABLE 4

Mean Change in Self-Evaluation for System Levels

System	Change in Self-Evaluation	
	Mean	Standard Deviation
I	0.116 ^a	0.237
II	0.147 ^a	0.339
III	0.303 ^b	0.265
IV	0.127 ^a	0.283
All Ss	0.173	0.290

Note: Cells containing the same subscript are not significantly different from each other at the .05 level by Duncan's new multiple range test.

indicated the degree to which subjects returned to their initial pre-experimental level. Eliminating the effect of arousal instructions was considered desirable in order to exclude differential heart rate response associated with neutral versus arousing instructions. More important, it provided a measure of arousal reduction in the sense of reduction to pre-experimental base heart rate.

Analysis of variance based on heart rate decrease (task less rest 2) revealed a significant difference in means for the arousal conditions ($F = 21.064$, $df = 1/96$, $p < .001$). Mean decrease for the aroused condition was 1.20 compared to 0.44 for the neutral

condition. This difference was expected since greater decrease is possible after arousal has been high than after a neutral condition. However, it also offered additional evidence that the arousal manipulation was effective.

Analysis of variance based on heart rate recovery (rest 2 less rest 1) showed no significant difference in means for arousal conditions, indicating that, in general, the effect of the arousal manipulation did not carry over to rest 2.

The correlations between change in self-evaluation and heart rate recovery indicated some significant relationships. For all systems, except System II, the relationship was an inverse one. This indicated that when the subject did not revert to his rest 1 heart rate but was more aroused during rest 2, his self-evaluation was less likely to change than when the heart rate during rest 2 was similar to than in rest 1.

As indicated in Table 5, the correlations between change in self-evaluation and heart rate recovery were significant for System III and approached significance for System I. Scatter diagrams revealed that the low correlations for Systems II and IV were not the result of a curvilinear relationship. The results were not appreciably changed when the effects of the self concept were partialled out. The means for heart rate recovery for system levels also indicated that Systems II and IV had less tendency to revert to their rest 1 level than was the case for Systems I and III.

TABLE 5

Correlations between Change in Self-Evaluation
and Heart Rate Recovery (Rest 2 less Rest 1)
and with Self-Concept Partialled Out

Systems	Change in Self-Evaluation and Heart Rate Recovery		Self-Concept Partialled Out	
	r	p	r	p
I	-0.345	<.10	-0.341	.10
II	0.149	n.s.	0.213	n.s.
III	-0.671	<.001	-0.675	<.001
IV	-0.234	n.s.	-0.259	n.s.
All Ss	-0.258	.01	-0.257	.01

Heart rate decrease (task less rest 2) took into account the amount of autonomic reactivity during task performance. As indicated in Table 6, high arousal reduction was associated with more change in self-evaluation for all systems except System II. Unlike the correlations between heart rate recovery and change in self-evaluation, the correlation in the present instance achieved significance for System IV. When the effect of the self-concept was partialled out, the level of significance for System IV increased.

The relation between change in self-evaluation and heart rate decrease with heart rate increase partialled out is also shown in Table 6. Unlike heart rate recovery, which compared the degree to which the first and second rests were similar, this measure focused on change in heart rate; that is, the change in rate following

presentation of a communication with the effects of the amount of change resulting from task instructions removed. Hence, like heart rate recovery, it eliminated the influence of manipulated arousal. Removing the effects of heart rate increase sharpened the effects on Systems I and III but reduced the effect for System IV.

TABLE 6

Correlations between Change in Self-Evaluation and Heart Rate Decrease (Task less Rest 2) and with Self Concept and Heart Rate Increase (Task less Rest 1) Partialled Out

Systems	Change in Self-Evaluation and Heart Rate Decrease		Self Concept Partialled Out		Heart Rate Increase Partialled Out	
	r	p	r	p	r	p
I	0.346	< .10	0.342	.10	0.428	< .05
II	0.125	n.s.	0.042	n.s.	-0.075	n.s.
III	0.359	< .10	0.361	.05	0.597	< .001
IV	0.389	< .05	0.484	< .01	0.348	< .10
All Ss	0.285	< .01	0.275	< .01	0.317	< .01

The Relationship between Communication Source, Level of Complexity, and Susceptibility to Social Influence

The characteristics of the communication source were varied by the nature of the explanation accompanying the communication. Significant relationships to other variables are presented in this section. The subject's rating of confidence in the source of the communication provided an indication of the degree to which the communication manipulation was effective, and could be used in

evaluating its influence on communication acceptance. The description of the source was also a variable related to the communication.

Analysis of variance based on change in self-evaluation revealed a significant difference depending on the nature of the communication--whether valued, devalued, or absent ($F = 10.260$, $df = 2/96$, $p < .001$). Both the valued and devalued communication produced a significantly greater amount of change in self-evaluation than the no-communication control, and the difference in means between the valued and devalued conditions approached significance. Mean change in self-evaluation for the three communication conditions are listed in Table 7.

TABLE 7

Mean Change in Self-Evaluation and Ratings of Confidence
in Source of Communication for Communication Conditions

Communication	Mean Change in Self Evaluation	Mean Ratings of Confidence
Valued	0.297 ^a	8.10 ^a
Devalued	0.196 ^a	7.48 ^a
Absent	0.028 ^b	5.93 ^b
All Ss	0.173	7.17

Note: Cells containing the same subscript are not significantly different from each other at the .05 level by Duncan's new multiple range test.

Analysis of variance based on confidence in the source of the communication revealed that the means for communication conditions differed significantly ($F = 9.296$, $df = 2/96$, $p < .001$). The means are listed in Table 7. While the means for valued and devalued communications did not differ significantly they were in the expected direction. These means suggest that the valued and devalued communications had some influence on how the source of the communication was perceived.

Analysis of variance based on heart rate decrease (task less rest 2) produced a significant difference in means for communication conditions, indicating that the communication influenced the amount of heart rate decrease experienced ($F = 10.644$, $df = 2/96$, $p < .001$). These means are contained in Table 8. Subjects receiving no communication showed practically no change in heart rate from task to rest 2.

TABLE 8

Means for Heart Rate Decrease (Task less Rest 2)
and Heart Rate Recovery (Rest 2 less Rest 1) for
Communication Conditions

Communications	Mean Heart Rate Decrease	Mean Heart Rate Recovery
Valued	1.12	0.01
Devalued	1.06	0.15
Absent	0.29	0.81
All Ss	0.82	0.32

The fact that absence of a communication resulted in so little heart rate decrease indicated that when feedback on task performance was not provided subjects remained aroused. A communication, whether from a valued or devalued source, apparently provided reassurance to subjects, which was reflected in heart rate.

Analysis of Variance based on heart rate recovery (rest 2 less rest 1) revealed significant differences in means depending on the communication ($F = 9.097$, $df = 2/96$, $p < .001$). The means for each communication condition are listed in Table 8. The higher the mean the less the reduction in autonomic reactivity. The least amount of recovery occurred when a communication was absent. Recovery following valued or devalued communications were in the expected direction but differences were not great.

Correlations between confidence in the source and change in self-evaluation, and confidence and other variables produced few significant values. The correlation between confidence and change in self-evaluation approached significance for System II ($r = 0.319$, $p < .10$). When the influence of the self concept was partialled out the correlation dropped slightly. As indicated in Table 9, the correlation between change in self-evaluation and self concept was significant for System II, and with the effects of confidence partialled out the significance was maintained ($r = 0.364$, $p = .05$). It appears that for System II both the self concept and confidence in the source of the communication had an

influence on change in self-evaluation.

For System IV subjects, heart rate recovery and confidence produced a significant correlation ($r = -0.381$, $p = .05$), indicating that when heart rate in System IV subjects was reduced toward rest 1 level, subjects' confidence in the source of the communication was greater. However, this association had a negligible influence on change in self-evaluation.

There were no differences in systems with respect to the description of the source of the communication. In all systems subjects were about evenly divided between "competent" and "interesting" in selecting a word to describe Professor Schiller. Not more than five subjects made other selections in any system.

Other Variables Associated with Cognitive Complexity and Change in Self-Evaluation

Subjects were selected so that the four system levels did not differ in self-concept. Correlations between self concept and change in self-evaluation are listed in Table 9. The correlations for Systems II and IV achieved significance and differed from those for Systems I and III at a significant level. Scatter diagrams indicated that the low correlations for Systems I and III were not the result of a non-monotonic function. These results remained unchanged when the influence of heart rate recovery was partialled out.

There was a significant difference in mean task time for systems ($F = 2.850$, $df = 3/96$, $p < .05$). These means are presented

TABLE 9

Correlations between Change in Self-Evaluation
and Self-Concept and with Heart Rate Recovery
(Rest 2 less Rest 1) Partialled Out

Systems	Change in Self-Evaluation and Self-Concept		Heart Rate Recovery Partialled Out	
	r	p	r	p
I	0.054	n.s.	0.020	n.s.
II	0.392	.05*	0.417	.05*
III	0.014	n.s.	0.101	n.s.
IV	0.407	.05*	0.420	.05*
All Ss	0.203	.05	0.202	.05

*Differ from correlations for Systems I and III at .01 level.

in Table 10. Subjects in System IV took significantly longer to complete the task than subjects in Systems I and III. The difference in means between Systems I and II approached significance with subjects in System II taking the longer time. Task time means followed the same order as heart rates. Subjects in System I took the least amount of time followed by Systems III, II and IV.

Task time for arousal conditions also revealed a significant difference in means ($F = 60.936$, $df = 1/96$, $p < .001$). Means for arousal conditions are shown in Table 11. This finding was expected since subjects in the aroused condition were told to work as quickly as possible while those in the neutral condition received

TABLE 10
Mean Task Time in Seconds for Systems

Systems	Mean
I	252.6 ^a
II	293.5 ^a
III	261.6 ^a
IV	317.6 ^b
All Ss	281.3

Note: Cells containing the same subscript are not significantly different from each other at the .05 level by Duncan's new multiple range test.

no such instruction. This finding is another indication that the arousal manipulation had the desired effect. The arousal manipulation also produced a significant difference in mean look time. Subjects in the neutral condition spent more time looking at the communication ($F = 6.313$, $df = 1/96$, $p < .025$). These means are also shown in Table 11. It may be that arousing instructions established a set regarding speed which carried over to other phases of the experiment.

It is of interest that correlations between change in self-evaluation and the time spent looking at the communication approached significance for Systems I and III ($r = 0.319$, $p = .10$; $r = 0.310$, $p = .10$). However, when the influence of heart rate

TABLE 11
Mean Task Time and Look Time in Seconds for
Arousal Conditions

Arousal	Mean Task Time	Mean Look Time
Aroused	212.3	43.8
Neutral	350.4	58.1
All Ss	281.3	51.0

recovery was partialled out the correlation for System III dropped while that for System I increased. These changes suggest that for System III subjects heart rate recovery was associated with change in self-evaluation, but that the relationship to look time was slight. The correlation between look time and change in self-evaluation can be accounted for in terms of a similar relationship between heart rate recovery and look time ($r = -0.323$, $p = .10$). Subjects spent more time looking if their heart rate was being reduced, and if they experienced arousal reduction there was an association with increased change in self-evaluation.

For System I subjects, however, the relation between heart rate recovery and look time was close to zero. Thus two factors appear to be independently related to communication acceptance among System I subjects. First, if subjects spent a long time looking at the communication they were more likely to modify their attitudes in the direction of the communication than if they looked

at it only briefly. Secondly, if subjects experienced reduction in heart rate to rest level they were more likely to accept the communication than if they did not.

Correlations between self concept and task time and look time were, in general, found to be non-significant. Only the correlation for System III between self concept and task time achieved significance ($r = -0.435$, $p = .02$), indicating that System III subjects took less time at the task if they had a high self concept. No significant correlations were found between self concept and measures of heart rate or heart rate change.

It was possible to obtain intelligence ratings on 89 of the 120 subjects. Since these ratings involved two different tests of intelligence, percentile scores were used. No significant correlations were found between intelligence and other variables with one exception. The correlation for System I subjects between intelligence and change in self-evaluation was significant ($r = -0.364$, $p = .05$, $n = 19$). This correlation suggested that for System I subjects, the higher the intelligence of the subject, the less likely he was to change his self-evaluation.

DISCUSSION

Walters and Parke (1964) concluded from their discussion of social motivation and social influence that susceptibility to social influence can be understood in terms of the eliciting of attending responses and the behavioral effects of variations in emotional responses. The present study does not provide evidence on the degree to which subjects attended to the communication presented, but it does offer some support for the contention that variations in emotional responses influence susceptibility to social influence. The variation which was found to have an effect on some groups of subjects was arousal reduction.

The presence of a communication providing feedback on task performance was found to have a profound effect on arousal reduction. When a communication was absent practically no arousal reduction was evidenced.

An association between arousal reduction and change in self-evaluation consistently emerged for subjects in System III on all measures. The association for subjects in System I was also fairly consistent, but on some measures the association merely approached significance. Arousal reduction was a factor for System IV subjects but to a more limited extent.

These findings offer some support to the proposal that arousal functions to facilitate susceptibility to social influence provided that the social influence procedures are relevant to the

source of arousal such that acceptance has the potential to reduce arousal level. In this study, positive feedback on task performance functioned to reduce arousal induced by task instructions. System level had a determining influence on reactions to reduction in arousal and its effect on communication acceptance.

It is possible that the associations found between arousal reduction and change in self-evaluation could be enhanced if the communication were presented to the subject during the height of arousal. Since subjects were tested in groups in this study, those who worked more quickly rested while others completed the task. For some subjects this period of rest might reduce arousal level. Communication presentation immediately upon task completion would not only make for greater procedural consistency, but might increase the reinforcing properties of arousal reduction, resulting from feedback on task performance, and hence the tendency to accept the content of the communication.

It is of interest that another variation in emotional response, an increase in arousal, was not found to be related to communication acceptance (except negatively for one group). It is possible that an increase in arousal functioned primarily to elicit attending responses. Whether or not attending is followed by acceptance may depend on subsequent reactions. When the situation allows for arousal reduction this may act as a reinforcement encouraging communication acceptance for many subjects. When the

situation does not permit arousal reduction after arousal has been induced, the tendency for the communication to be accepted may be decreased.

Subjects varying in cognitive complexity did not differ in heart rate for baseline rest, task, or heart rate increase from baseline rest to task. Heart rates for the second rest period suggest that System IV subjects had a faster rate than System I subjects with System III subjects tending to be similar to System I. This pattern was also reflected in the association between change in self-evaluation and baseline heart rate. Subjects in Systems I and III were more inclined than subjects in Systems II and IV to change their self-evaluations if their pre-experimental heart rate was high, but for System III a high increase in arousal from baseline rest to task was associated with less change in self-evaluation.

It was noted that the system levels followed a consistent ordering with respect to heart rate with System I having the lowest rate, followed by Systems III, II and IV. This same pattern was reflected in a significant difference in time taken to complete the task, with the faster rates associated with longer periods of time. This ordering of systems with respect to heart rate was of interest because of other similarities found between Systems II and IV.

There were few significant differences among systems with

respect to arousal level. However, there were differences among systems in communication acceptance which were related to heart rate.

It is possible that significant differences in base heart rate would have been found had the initial rest period been longer. It was noted that for some subjects in Systems I and III base heart rate was greater than during the second rest period. This suggests that subjects in these systems were more aroused than those in Systems II and IV before the experiment began, thus elevating the base heart rate. Had it been possible to obtain a true basal heart rate level, Systems I and III may have had significantly lower heart rates than Systems II and IV.

System III subjects changed self-evaluation more than subjects in any other system. System I subjects produced the lowest mean change. This finding is contrary to findings in deprivation studies where the greatest amount of attitude change occurred in concrete subjects, but is consistent with the findings of Streufert (1966) and Janicki (1964) in whose studies System I subjects showed the least change. Some clarification of this apparent inconsistency may be found by examining change under neutral conditions. Unlike Systems II and IV, Systems I and III produced greater change in self-evaluation under neutral than aroused conditions. It may be that when arousal was induced by ego-involving instructions System I subjects actively resisted

influence. The same tendency may exist for System III subjects but to a lesser degree. Possibly the pressure of the situation in the aroused condition caused System I subjects to become inflexible or to block input.

Harvey (1964) found that System III subjects were more influenced than subjects in other systems in a conformity situation. The amount of change induced followed the order Systems III, II, I and IV. In the present study the mean change in self-evaluation followed the order Systems III, II, IV and I. It is possible that the factor of arousal reduction in the research reported caused System IV subjects to be more susceptible to influence than in Harvey's study.

Systems I and III

Harvey, Hunt and Schroder maintain that Systems I and III are similar insofar as both look to external anchors as guidelines for behavior. This study offers some support for this contention. Susceptibility to social influence in both systems was associated with arousal reduction; the greater the arousal reduction the more change in self-evaluation. Arousal reduction in this study was a consequence of situational factors. No association was found for either system between change in self-evaluation and self concept, which is a variable unrelated to the immediate situation.

A difference between Systems I and III was revealed in the association between the increase in heart rate from baseline rest

to task and change in self-evaluation. System III produced the only significant and negative correlation, indicating that a high increase in arousal was associated with less change than a low increase. In spite of the fact that System III subjects changed attitudes more than subjects in other systems under aroused conditions, they appeared to be even more susceptible to influence when not aroused. The relationship for System I, on the other hand, between heart rate increase and change in self-evaluation was close to zero.

Systems II and IV

Harvey, Hunt and Schroder contend that Systems II and IV are both marked by independence. In System II independence is negative, a reaction against authority or imposition. In System IV independence takes the form of autonomy which makes it possible for the individual to evaluate objectively, taking many dimensions into consideration.

Some support for this position is available from the research reported. For both Systems II and IV a significant association was found between change in self-evaluation and self concept. This relationship was positive indicating that subjects with high self-concepts were more influenced. The self concept is an underlying predisposition to evaluate oneself in a certain way. It is an internal anchor which influences behavior.

A second independent factor which was found to be associated with susceptibility to change in System II only was confidence in the source of the communication. Subjects in System II who gave a high confidence rating showed more communication acceptance. Confidence, like the self concept, is an attitude derived from information and impressions formulated over time. Both these variables have their locus within the individual himself.

System II subjects appear to have reacted according to theoretical expectation. They were not influenced by situationally based variables such as arousal reduction, but they were influenced by their own attitudes. They reacted independently.

The relationships found for System IV were more complex. Like System II, susceptibility to social influence was positively associated with self concept, but in addition these subjects were influenced by change in heart rate. Heart rate change in this experiment can be traced to situational factors. In addition there was an association between heart rate recovery and confidence but this association did not influence change in self-evaluation. Either arousal reduction produced greater confidence or was caused by it. In any event, results suggested that System IV subjects were taking a larger variety of factors into consideration. Change in self-evaluation was influenced by their attitude toward themselves and by physiological changes induced by environmental events. In addition, they refrained from being influenced by the association

between confidence in the source and heart rate recovery. System IV subjects appear to have reacted in a more complex manner than did subjects from any other system. This finding is consistent with Crano and Schroder (1967) who found that conceptually abstract subjects utilized a greater number of available processes of conflict resolution than concrete subjects, and were not bound by the condition of internal consistency.

Implications and Conclusions

The results of the study reported support the general contention that cognitive complexity is an individual difference dimension which has relevance to susceptibility to social influence. Reports of other studies using this dimension indicate that the situational context has a profound effect on the level of complexity which is likely to be most influenced by a communication. Results of studies vary depending on whether or not arousal is a factor, and when it is, on the nature of the arousing condition, whether a consequence of deprivation, ego-involvement, or social pressure. It is accepted that level of arousal affects the quality of task performance. Theorists, such as Walters and Parke, have recognized the importance of variations in emotional responses in influencing behavior of other kinds. The possibility of arousal reduction occurring within the experimental situation appears to be one such variation which needs to be taken into consideration. There is a need for research which systematically specifies the

conditions under which subjects functioning at different system levels are most likely to be susceptible to social influence, as well as for more exploratory work which investigates the mechanisms which mediate susceptibility to change.

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APPENDICES

APPENDIX A

INDIVIDUAL - TOPICAL INVENTORY
(Form A)

NAME _____ SCHOOL _____

INSTRUCTIONS

You will be given some situations and topics to which we would like you to respond. The responses are given in pairs. You are to choose one response from each pair. Choose the response that most closely fits your opinion or feeling and indicate your choice by circling the letter "A" or "B" corresponding to the response chosen. Always choose one member of each pair. Never choose both members of the pair and do not skip over any of the pairs. If you agree with both, choose the one you agree with most strongly. If you do not agree with either, choose the one you find the least disagreeable of the two.

Example:

Here is an example of the way the questions will be asked and the way they should be answered. The manner in which you will indicate your choice between the two given responses is illustrated below:

When I am confused . . .

Pair No.	
(i)	
(A)	B
I try to find a solution and end the confusion	I completely ignore the fact I am confused.
(ii)	
A	(B)
I break out into a nervous sweat	I remain calm at all times.

How to respond:

First: Decide which response you agree with most.

Second: Indicate which response you agree with most by circling the identifying letter. Thus, if in comparing the first pair of statements, you agree with the statement, "I try to find a solution and end the confusion," more than with the statement, "I completely ignore the fact that I am confused," you would circle the letter "A" (above the chosen statement). Having chosen one (never both,

never neither) statement from the first pair of statements, you would then move on to the second pair. If, in considering the second pair, you find that you agree more with the statement, "I remain calm at all times," (as compared to the statement, "I break out into a nervous sweat") you would circle the letter "B".

On the pages that follow there are 36 different pairs of responses. There are six pairs on a page. You are to select one response from each pair, the one that more accurately shows your opinion or feeling and record your choice by circling the letter indicating the statement chosen. Be frank and indicate, in each case, your true feeling or opinion or the reaction which you actually would make in the situation. Do not indicate how you should feel or act; rather, indicate how you do feel and act.

Make sure that you are aware of the situation or topic that each pair of responses refers to. You will find the situation or topic identified at the top of each page. All items on the page refer to the situation or topic appearing at the top of that page.

When you are finished, your paper should contain 36 circles. Check back and make sure that you have made 36 choices, no more no less.

Remember: (1) Respond only once for each pair; that is, choose one member of the pair, never both, never neither. Indicate your choice by circling either "A" or "B".

(2) When you are finished you should have made 36 circles.

Work at your own rate of speed but work straight through the inventory without stopping. Once you have completed a page do not return to it.

YOU MAY BEGIN

Appendix A (continued)

1. Imagine that someone has criticized you. Choose the response from each pair that comes closest to your feelings about such criticism. Indicate your choice by circling either "A" or "B".

When I am criticized . . .

Pair No.	
A	B
(1)	
I try to take the criticism, think about it, and value it for what it is worth. Unjustified criticism is as helpful as justified criticism in discovering what other people's standards are.	I try to accept the criticism but often find that it is not justified. People are too quick to criticize something because it doesn't fit their standards.
A	B
(2)	
I try to determine whether I was right or wrong. I examine my behavior to see if it was abnormal. Criticism usually indicates that I have acted badly and tends to make me aware of my own bad points.	It could possibly be that there is some misunderstanding about something I did or said. After we both explain our viewpoints, we can probably reach some sort of compromise.
A	B
(3)	
I listen to what the person says and try to accept it. At any rate, I will compare it to my own way of thinking and try to understand what it means.	I feel that either I'm not right, or the person who is criticizing me is not right. I have a talk with that person to see what's right or wrong.
A	B
(4)	
I usually do not take it with good humor. Although, at times, constructive criticism is very good, I don't always think that the criticizer knows what he is talking about.	At first I feel that it is unfair and that I know what I am doing, but later I realize that the person criticizing me was right and I am thankful for his advice. I realize that he is just trying to better my actions.
A	B
(5)	
I try to ask myself what advantages this viewpoint has over mine. Sometimes both views have their advantages and it is better to combine them. Criticism usually helps me to learn better ways of dealing with others.	I am very thankful. Often I can't see my own errors because I am too engrossed in my work at the time. An outsider can judge and help me correct the errors. Criticism in everyday life usually hurts my feelings, but I know it is for my own good.
A	B
(6)	
It often has little or no effect on me. I don't mind constructive criticism too much, but I dislike destructive criticism. Destructive criticism should be ignored.	I try to accept and consider the criticism. Sometimes it has caused me to change myself; at other times I have felt that the criticism didn't really make much sense.

2. Imagine that you are in doubt. Choose the response from each pair that comes closest to your feelings about such doubt. Indicate your choice by circling either "A" or "B".

When I am in doubt . . .

Pair No.	
A	B
I become uncomfortable. Doubt can cause confusion and make one do a poor job. When one is in doubt he should ask and be sure of himself.	I find myself wanting to remove the doubt, but this often takes time. I may ask for help or advice if I feel that my questions won't bother the other person.
A	(8) B
I don't get too upset about it. I don't like to ask someone else unless I have to. It's better to discover the correct answer on your own	I usually go to someone who knows the correct answer to my question. I go to a book which will set me straight by removing the doubt.
A	(9) B
I first try to reason things out and check over the facts. Often I approach others to get ideas that will provide a solution.	I think things over, ask questions, and see what I can come up with. Often several answers are reasonable and it may be difficult to settle on one.
A	(10) B
I realize that I'll have to decide on the correct answer on my own. Others try to be helpful, but often do not give me the right advice. I like to judge for myself.	I usually try to find out what others think, especially my friends. They may not know the answer, but they often give me some good ideas.
A	(11) B
I look over the problem and try to see why there is a doubt. I try to figure things out. Sometimes I just have to wait awhile for an answer to come to me.	I try to get some definite information as soon as possible. Doubt can be bad if it lasts too long. It's better to be sure of yourself.
A	(12) B
I consider what is best in the given situation. Although one should not rush himself when in doubt, he should certainly try to discover the right answer	I act according to the situation. Sometimes doubt can be more serious than at other times and many of our serious doubts must go unanswered.

3. Imagine that a friend has acted differently toward you. Choose the response from each pair that comes closest to your feelings about such an action. Indicate your choice by circling either "A" or "B".

When a friend acts differently toward me . . .

Pair No.		
A	(13)	B
I am not terribly surprised because people act in many different ways. We are different people and I can't expect to understand all his reasons for acting in different ways.		I am usually somewhat surprised but it doesn't bother me very much. I usually act the way I feel towards others. People worry too much about others' actions and reactions.
A	(14)	B
I find out why. If I have done something wrong I will try to straighten out the situation. If I think he's wrong, I expect him to clear things up.		I feel that I may have caused him to act in a different way. Of course, he may have other reasons for acting differently which would come out in time.
AA	(15)	B
I first wonder what the trouble is. I try to look at it from his viewpoint and see if I might be doing something to make him act differently toward me.		It is probably because he has had a bad day, which would explain this different behavior; in other cases he may just be a changeable kind of person.
A	(16)	B
It is probably just because something is bothering him. I might try to cheer him up or to help him out. If these things didn't work I would just wait for him to get over it.		I try to understand what his different actions mean. I can learn more about my friend if I try to figure out why he does things. Sometimes the reasons may not be very clear.
A	(17)	B
There has to be a definite reason. I try to find out this reason, and then act accordingly. If I'm right I'll let him know it. If he's wrong, he should apologise.		I usually let him go his way and I go mine. If a friend wants to act differently that's his business, but it's my business if I don't want to be around when he's that way.
A	(18)	B
I don't get excited. People change and this may cause differences. It is important to have friends, but you can't expect them to always be the same.		I like to get things back to normal as soon as possible. It isn't right for friends to have differences between them. Whoever is at fault should straighten himself out.

4. Think about the topic of people in general. Choose the responses from each pair that comes closest to your thoughts about people. Indicate your choice by circling either "A" or "B".

This I believe about people . . .

Pair No.	
A	B
Whatever differences may exist between persons, they can usually get along if they really want to. Although their ideas may not agree, they probably still have something in common.	People can learn from those who have different ideas. Other people usually have some information or have had some experience which is interesting and can add to one's knowledge.
A	B
People can act in all sorts of ways. No single way is always best, although at certain times a particular action might be wiser than others.	Each person should be able to decide the correct thing for himself. There are always a few choices to be made and the individual himself is in the best position to pick the right one.
A	B
Some people think they know what's best for others and try to give advice. These people shouldn't make suggestions unless asked for help.	There are certain definite ways in which people should act. Some don't know what the standards are and therefore need to be straightened out.
A	B
I can tell if I am going to get along with a person very soon after meeting him. Most people act either one way or another and usually it is not difficult to say what they are like.	It's hard for me to say what a person is like until I've known him a long time. People are not easy to understand and often act in unpredictable ways.
A	B
People have an outside appearance that usually isn't anything like what can be found on the inside, if you search long and hard enough.	Each person is an individual. Although some people have more good or bad points than others, no one has the right to change them.
A	B
People can be put into categories on the basis of what they're really like. Knowing the way a person really is helps you to get along with him better.	People are unlike one another in many respects. You can get along with people better and better understand them if you are aware of the differences.

5. Think about the general topic of leaders. Choose the response from each pair that comes closest to your thoughts about leaders. Indicate your choice by circling either "A" or "B".

Leaders . . .

Pair No.	
A	B
Leaders do not always make the right decisions. In such cases, it is wise for a man to look out for his own welfare.	Leaders are necessary in all cases. If a leader cannot make the right decisions another should be found who can.
A	B
Leaders cannot provide all the answers. They are like other people--they have to try to figure out what action is necessary and learn from their mistakes.	Leaders make decisions sometimes without being sure of themselves. We should try to understand this and think of ways to help them out.
A	B
I like a leader who is aware of how the group feels about things. Such a leader would not lead any two groups in exactly the same way.	A person should be able to put his confidence in a leader and feel that the leader can make the right decision in a difficult situation.
A	B
There are times when a leader shouldn't make decisions for those under him. The leader has the power to decide things, but each man has certain rights also.	A leader should give those under him some opportunity to make decisions, when possible. At times the leader is not the best judge of a situation and should be willing to accept what others have to say.
A	B
Some leaders are good, others are quite poor. Good leaders are those who know what is right for the men under them. These leaders deserve the respect of every man.	Leaders cannot be judged easily. Many things go to make up good leadership. Most people fall short in some way or another, but that is to be expected.
A	B
Leaders are needed more at certain times than at others. Even though people can work out many of their own problems, a leader can sometimes give valuable advice.	Some people need leaders to make their decisions. I prefer to be an individual and decide for myself, when possible. Most leaders won't let you do this.

6. Imagine that someone has found fault with you. Choose the response from each pair that comes closest to your feelings about such a situation. Indicate your choice by circling either "A" or "B".

When other people find fault with me . . .

Pair No.		
A	(31)	B
It means that someone dislikes something I'm doing. People who find fault with others are not always correct. Each person has his own ideas about what's right.		It means that someone has noticed something and feels he must speak out. It may be that we don't agree about a certain thing. Although we both have our own ideas, we can talk about it.
A	(32)	B
I first wonder if they are serious and why they have found fault with me. I then try to consider what they've said and make changes if it will help.		If enough people point out the same fault, there must be something to it. I try to rid myself of the fault, especially if the criticizers are people "in-the-know."
A	(33)	B
They have noticed something about me of which I am not aware. Although criticism may be hard to take, it is often helpful.		They are telling me something they feel is correct. Often they may have a good point which can help me in my own thinking. At least it's worthwhile to consider it.
A	(34)	B
I may accept what is said or I may not. It depends upon who is pointing out the fault. Sometimes best to just stay out of sight.		I accept what is said if it is worthwhile, but sometimes I don't feel like changing anything. I usually question the person.
A	(35)	B
I like to find out what it means; since people are different from one another, it could mean almost anything. A few people just like to find fault with others but there's usually something to be learned.		There is something to be changed. Either I am doing something wrong or else they don't like what I'm doing. Whoever is at fault should be informed so that the situation can be set straight.
A	(36)	B
I don't mind if their remarks are meant to be helpful, but there are too many people who find fault just to give you a hard time.		It often means that they're trying to be disagreeable. People get this way when they've had a bad day. I try to examine their remarks in terms of what's behind them.

CHECK AND MAKE SURE THAT YOU'VE CHOSEN ONE MEMBER OF EACH PAIR
(A TOTAL OF 36 CIRCLES)

INDIVIDUAL TOPICAL INVENTORY SCORING KEY

<u>Pair No.</u>	<u>SYSTEM</u>		<u>No.</u>	<u>SYSTEM</u>	
	<u>A</u>	<u>B</u>		<u>A</u>	<u>B</u>
1.	3	2	19.	3	4
2	1	4	20.	4	2
3.	3	1	21.	2	1
4.	2	1	22.	1	4
5.	4	3	23.	3	2
6.	2	4	24.	1	3
7.	1	3	25.	2	1
8.	2	1	26.	4	3
9.	3	4	27.	3	1
10.	2	3	28.	2	4
11.	4	1	29.	1	4
12.	2	4	30.	3	2
13.	4	2	31.	2	4
14.	1	3	32.	3	1
15.	3	2	33.	3	4
16.	3	4	34.	1	2
17.	1	2	35.	4	1
18.	4	1	36.	2	3

NORMS FOR INDIVIDUAL TOPICAL INVENTORY

(Obtained from 461 Naval Trainees - Tuckman)

<u>DECILE</u>	<u>SYSTEMS</u>			
	I	II	III	IV
10	13+	12+	12+	13+
9	12	11	11	12
<hr/>				
8	11	10	10	11
<hr/>				
7	10-11	9	9-10	10-11
6	9-	8-	8-	9-

SYSTEM SCORING:

If S scores 9th or 10th Decile in one system and 8th or lower in all others, classify him in his highest system.

If necessary, Ss who score 8th Decile in one system and 6th or lower in all others may also be classified in highest scoring system.

APPENDIX B

There is a need for each of us to know more about ourselves, but seldom do we have an opportunity to look at ourselves as we are or as we would like to be. On the following page is a list of terms that to a certain degree describe people. Take each term separately and apply it to yourself by completing the following sentence:

I AM A (AN) _____ PERSON.

The first word in the list is academic, so you would substitute this term in the above sentence. It would read--I am an academic person.

Then decide HOW MUCH OF THE TIME this statement is like you, i.e., is typical or characteristic of you as an individual, and rate yourself on a scale from one to five according to the following key:

1. Seldom, is this like me.
2. Occasionally, this is like me.
3. About half of the time, this is like me.
4. A good deal of the time, this is like me.
5. Most of the time, this is like me.

Select the number beside the phrase that tells how much of the time the statement is like you and insert it in Column I on the next page.

EXAMPLE: Beside the term ACADEMIC, number two is inserted to indicate that--occasionally, I am an academic person.

Now go to Column II. Use one of the statements given below to tell HOW YOU FEEL about yourself as described in Column I.

1. I very much dislike being as I am in this respect.
2. I dislike being as I am in this respect.
3. I neither dislike being as I am nor like being as I am in this respect.
4. I like being as I am in this respect.
5. I like very much being as I am in this respect.

You will select the number beside the statement that tells how you feel about the way you are and insert the number in Column II.

EXAMPLE: In Column II beside the term ACADEMIC, number one is inserted to indicate that I dislike very much being as I am in respect to the term, academic. Note that being as I am always refers to the way you described yourself in Column I.

Finally, go to Column III; using the same term, complete the following sentence:

I WOULD LIKE TO BE A (AN) _____ PERSON

Then decide HOW MUCH OF THE TIME you would like this trait to be characteristic of you and rate yourself on the following five point scale:

1. Seldom, would I like this to be me.
2. Occasionally, I would like this to be me.
3. About half of the time, I would like this to be me.
4. A good deal of the time, I would like this to be me.
5. Most of the time, I would like this to be me.

You will select the number beside the phrase that tells how much of the time you would like to be this kind of a person and insert the number in Column III.

EXAMPLE: In Column III, beside the term ACADEMIC, number five is inserted to indicate that most of the time, I would like to be this kind of person.

Start with the word ACCEPTABLE and fill in Columns I, II and III before going on to the next word. Be honest with yourself so that your description will be a true measure of how you look at yourself.

Name _____

"SELF"

Sex _____

I II III

I II III

a. academic

1. acceptable	_____	_____	_____	26. merry	_____	_____	_____
2. accurate	_____	_____	_____	27. mature	_____	_____	_____
3. alert	_____	_____	_____	28. nervous	_____	_____	_____
4. ambitious	_____	_____	_____	29. normal	_____	_____	_____
5. annoying	_____	_____	_____	30. optimistic	_____	_____	_____
6. busy	_____	_____	_____	31. poised	_____	_____	_____
7. calm	_____	_____	_____	32. purposeful	_____	_____	_____
8. charming	_____	_____	_____	33. reasonable	_____	_____	_____
9. clever	_____	_____	_____	34. reckless	_____	_____	_____
10. competent	_____	_____	_____	35. responsible	_____	_____	_____
11. confident	_____	_____	_____	36. sarcastic	_____	_____	_____
12. considerate	_____	_____	_____	37. sincere	_____	_____	_____
13. cruel	_____	_____	_____	38. stable	_____	_____	_____
14. democratic	_____	_____	_____	39. studious	_____	_____	_____
15. dependable	_____	_____	_____	40. successful	_____	_____	_____
16. economical	_____	_____	_____	41. stubborn	_____	_____	_____
17. efficient	_____	_____	_____	42. tactful	_____	_____	_____
18. fearful	_____	_____	_____	43. teachable	_____	_____	_____
19. friendly	_____	_____	_____	44. useful	_____	_____	_____
20. fashionable	_____	_____	_____	45. worthy	_____	_____	_____
21. helpful	_____	_____	_____	46. broad-minded	_____	_____	_____
22. intellectual	_____	_____	_____	47. businesslike	_____	_____	_____
23. kind	_____	_____	_____	48. competitive	_____	_____	_____
24. logical	_____	_____	_____	49. fault-finding	_____	_____	_____
25. meddlesome	_____	_____	_____				

DIRECTIONS FOR SCORING THE INDEX OF ADJUSTMENT AND VALUES

The scores of the Index are obtained by adding each of the three columns and by finding the sum of the differences between Column I and Column III, summed without regard for sign.

Discrepancy Score. The discrepancy score is the total of the difference between the self-concept (Column I) and the ideal self ratings (Column III).

Note the differences between Column I and Column III ratings and write these differences in a fourth column to the right of Column III. Disregard the signs of the differences and total this fourth column to obtain the discrepancy score.

Reversing negative traits. Before adding Column I and Column III, the rating on negative traits must be reversed so they have meanings comparable to the ratings on the positive traits. To illustrate, suppose a subject places a 1 in Column I for the trait "cruel." This means that he is saying, "Seldom am I a cruel person." Since this is a negative trait he has given himself the highest possible rating--comparable to a rating of 5 on a positive trait such as "dependable." For the total score on Column I (or Column III) to reflect that a 1 on a negative trait is a high rating, the 1 should be changed to a 5. Similarly, a 2 on a negative trait should be changed to a 4, a 3 remains the same, a 4 becomes a 2, and a 5 becomes a 1. For most people, items 5 (annoying), 13 (cruel), 18 (fearful), 41 (stubborn), and 49 (fault-finding) are negative traits and the ratings in columns I and III should be reversed before adding these columns.

More exactly, a negative trait is defined as any trait with a negative discrepancy between Columns I and III, or a trait with a 1 or 2 rating in Columns I and III and a 3, 4 or 5 rating on Column II. In practice, little difference in total scores results when the Column I and III rating of items 5, 13, 18, 25, 34, 41, and 49 are reversed for all subjects and this is recommended practice when testing large groups of subjects. One note of emphasis. Ratings in Column II are not reversed since these are not affected by the negative-positive nature of the trait.

After the negative traits have been reversed, Columns I, II, and III may be summed and these are the self-concept, acceptance-of-self, and concept of the ideal-self scores, respectively.

PRE-EXPERIMENTAL ADMINISTRATION

Presented is a list of terms that to a certain degree describe people. Take each term separately and apply it to yourself by completing the following sentence:

I AM A (AN) _____ PERSON

The first word in the list is academic, so you would substitute this term in the above sentence. It would read--I am an academic person.

Then decide HOW MUCH OF THE TIME this statement is like you, i.e., is typical or characteristic of you as an individual, and rate yourself on a scale from one to five according to the following key:

1. Seldom, is this like me.
2. Occasionally, this is like me.
3. About half of the time, this is like me.
4. A good deal of the time, this is like me.
5. Most of the time, this is like me.

Select the number beside the phrase that tells how much of the time the statement is like you and insert it beside the word.

Appendix B (continued)

91.

Name _____

- | | | | |
|------------------|-------|-------------------|-------|
| a. academic | _____ | | |
| 1. acceptable | _____ | 26. merry | _____ |
| 2. accurate | _____ | 27. mature | _____ |
| 3. alert | _____ | 28. nervous | _____ |
| 4. ambitious | _____ | 29. normal | _____ |
| 5. annoying | _____ | 30. optimistic | _____ |
| 6. busy | _____ | 31. poised | _____ |
| 7. calm | _____ | 32. purposeful | _____ |
| 8. charming | _____ | 33. reasonable | _____ |
| 9. clever | _____ | 34. reckless | _____ |
| 10. competent | _____ | 35. responsible | _____ |
| 11. confident | _____ | 36. sarcastic | _____ |
| 12. considerate | _____ | 37. sincere | _____ |
| 13. cruel | _____ | 38. stable | _____ |
| 14. democratic | _____ | 39. studious | _____ |
| 15. dependable | _____ | 40. successful | _____ |
| 16. economical | _____ | 41. stubborn | _____ |
| 17. efficient | _____ | 42. tactful | _____ |
| 18. fearful | _____ | 43. teachable | _____ |
| 19. friendly | _____ | 44. useful | _____ |
| 20. fashionable | _____ | 45. worthy | _____ |
| 21. helpful | _____ | 46. broad-minded | _____ |
| 22. intellectual | _____ | 47. businesslike | _____ |
| 23. kind | _____ | 48. competitive | _____ |
| 24. logical | _____ | 49. fault-finding | _____ |
| 25. meddlesome | _____ | | |

POST-COMMUNICATION ADMINISTRATION

Name _____

How much of the time do you feel the following statements are typical or characteristic of you as an individual? Rate yourself on a scale from one to five according to the following key:

1. Seldom, is this like me.
2. Occasionally, this is like me.
3. About half of the time, this is like me.
4. A good deal of the time, this is like me.
5. Most of the time, this is like me.

Select the number beside the phrase that tells how much of the time the statement is like you and insert it in the column provided.

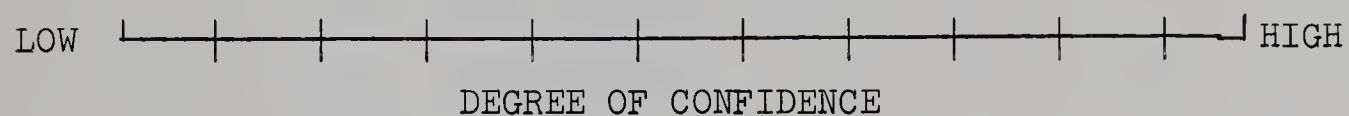
I am a (_____) person.

- | | | | |
|----------------|-------|-------------------|-------|
| 1. alert | _____ | 16. nervous | _____ |
| 2. calm | _____ | 17. normal | _____ |
| 3. charming | _____ | 18. optimistic | _____ |
| 4. clever | _____ | 19. poised | _____ |
| 5. competent | _____ | 20. reasonable | _____ |
| 6. confident | _____ | 21. reckless | _____ |
| 7. considerate | _____ | 22. responsible | _____ |
| 8. democratic | _____ | 23. sarcastic | _____ |
| 9. efficient | _____ | 24. sincere | _____ |
| 10. fearful | _____ | 25. stable | _____ |
| 11. friendly | _____ | 26. tactful | _____ |
| 12. helpful | _____ | 27. worthy | _____ |
| 13. logical | _____ | 28. broad-minded | _____ |
| 14. mature | _____ | 29. businesslike | _____ |
| 15. kind | _____ | 31. fault-finding | _____ |
| | | 31. dependable | _____ |

APPENDIX C

Name _____

On the scale provided below, please indicate your degree of confidence in the personality assessment derived from the use of Schiller's technique. Place a tick between the cut-off points.



Name _____

Circle the number beside the word which from your brief exposure to Professor Schiller's work, in your opinion best describes this man.

1. High status
2. Influential
3. Competent
4. Powerful
5. Prestigious
6. Interesting person

TASK INSTRUCTIONS

Aroused Condition

I am going to give you a simple perceptual task to do. All you have to do is to copy the patterns shown on the six cards. Use a separate sheet of paper for each card. As you complete one, tear off the page and pass it through the slot.

This test has been widely used in clinic settings to assess emotional stability, personality characteristics, and sexual adjustment. Based on the way a person executes this task it is possible to make predictions regarding his behavior in a number of areas. Scoring is based on such factors as placing on the page, size, and other characteristics of your reproduction.

Work as quickly as you can as speed is one determining factor, and there is a time limit. I record the time you spend on each drawing.

Pass your completed drawing through the slot just as soon as you have completed it. All you have to do is copy the designs on the cards. I will begin evaluating the results according to a method recently devised while you are working.

When the evaluation has been completed I will let you know how you made out. (This sentence was not included in the No-communication Condition).

Now begin.

(Subjects were urged to hurry from time to time as they worked).

Neutral Condition

I am going to give you a simple perceptual task to do. All you have to do is to copy the patterns shown on the six cards. Use a separate sheet of paper for each card. As you complete one, tear off the page and pass it through the slot.

Work at your normal rate of speed. There is no time limit.

Now go ahead and begin to copy the designs on the cards.

EXPLANATION OF COMMUNICATION

Communication--Valued Source

I have now completed scoring the test (Aroused Condition).

I would like you to have a look at this evaluation of yourself (Neutral Condition).

As you see the scoring method is quick and simple, and it makes it possible to rate people on a number of characteristics on a five-point scale.

The designs themselves were devised by Bender a number of years ago. Since that time, a new scoring procedure has been devised by Professor Schiller who is associated with the University as well as being Director of Psychological Services of the Hamstead Clinic.

From the numerous papers published by Professor Schiller, his colleagues, and other psychologists working in this field, it has been demonstrated that this method does reflect actual personality characteristics and is related to the actual behavior of the individual. It has been found to correlate highly with other more time-consuming tests which attempt to measure the same characteristics.

Communication--Devalued Source

I have now completed scoring the test (Aroused Condition).

I would like you to have a look at this evaluation of yourself (Neutral Condition).

As you see the scoring method is quick and simple, and it makes it possible to rate people on a number of characteristics on a five-point scale.

The designs themselves were devised by Bender a number of years ago. Since that time, a new scoring procedure has been devised by Professor Schiller who is associated with the University as well as being Director of Psychological Services at the Hamstead Clinic. He is interested in trying to find an assessment technique which is less time consuming than other tests which attempt to measure the same characteristics. The reliability of the test has not yet been established--that is, it is not known if people respond in the same way on a second administration of the test. The validity of the test is also still in question--that is, the personality characteristics derived from the test have not been tested against outside criterion to determine if the tested individuals actually do possess the characteristics found by test results.

Schiller has been criticized by many psychologists for attempting to assess something as complex as personality with a test which draws only on the ability to reproduce simple designs.

PERSONALITY PROFILE

Schiller (1965)

Name _____

DEPENDABLE	✓	UNDEPENDABLE
CONSIDERATE	✓	INCONSIDERATE
STABLE	✓	UNSTABLE
FRIENDLY	✓	UNFRIENDLY
BROAD-MINDED	✓	NARROW-MINDED
OPTIMISTIC	✓	PESSIMISTIC
LOGICAL	✓	ILLOGICAL
POISED	✓	LACKING POISE
KIND	✓	UNKIND

SUMMARIES OF ANALYSES OF VARIANCE

Table 1Change in Self-Evaluation

Source of Variation	Sum of Squares	df	Mean Square	F	p
A: Systems	.688	3	.229	3.187	<.05
B: Arousal	.137	1	.137	1.900	
C: Communications	1.478	2	.738	10.260	<.001
A X B	.382	3	.127	1.769	
A X C	.099	6	.017	0.230	
B X C	.045	2	.023	0.315	
A X B X C	.260	6	.043	0.601	
Error	6.913	96	.072		

Table 2Level of Confidence in Source of Communication

Source of Variation	Sum of Squares	df	Mean Square	F	p
A: Systems	10.867	3	3.622	0.671	
B: Arousal	2.133	1	2.133	0.395	
C: Communications	100.317	2	50.158	9.296	<.001
A X B	35.400	3	11.800	2.187	
A X C	35.083	6	5.847	1.084	
B X C	3.617	2	1.808	0.335	
A X B X C	31.250	6	5.208	0.965	
Error	518.000	96	5.396		

Table 3Time (in seconds) to complete Task

Source of Variation	Sum of Squares	df	Mean Square	F	p
A: Systems	80270.4	3	26756.8	2.850	<.05
B: Arousal	572010.0	1	572010.0	60.936	<.001
C: Communications	23714.0	2	11857.0	1.263	
A X B	21738.1	3	7246.0	0.772	
A X C	93209.3	6	15534.9	1.655	
B X C	30371.6	2	15185.8	1.618	
A X B X C	78346.0	6	13057.7	1.391	
Error	901158.0	96	9387.1		

Table 4Time (in seconds) Spent Looking at Communication

Source of Variation	Sum of Squares	df	Mean Square	F	p
A: Systems	1581.2	3	527.1	0.539	
B: Arousal	6177.7	1	6177.7	6.313	<.025
C: Communications	136.7	2	68.4	0.070	
A X B	409.8	3	136.6	0.140	
A X C	6100.2	6	1016.7	1.039	
B X C	1110.7	2	555.3	0.567	
A X B X C	6257.0	6	1042.8	1.066	
Error	93941.6	96	978.6		

Table 5Rest 1 Heart Rate (Mean of 10 Second Intervals)

Source of Variation	Sum of Squares	df	Mean Squares	F	p
A: Systems	10.206	3	3.402	0.945	
B: Arousal	4.524	1	4.524	1.257	
C: Communications	8.271	2	4.136	1.149	
A X B	6.425	3	2.142	0.595	
A X C	30.589	6	5.098	1.416	
B X C	9.640	2	4.820	1.339	
A X B X C	21.152	6	3.525	0.979	
Error	345.604	96	3.600		

Table 6Task Heart Rate (Mean of 10 Second Intervals)

Source of Variation	Sum of Squares	df	Mean Squares	F	p
A: Systems	9.868	3	3.289	0.940	
B: Arousal	4.355	1	4.355	1.244	
C: Communications	11.524	2	5.762	1.646	
A X B	7.620	3	2.540	0.726	
A X C	28.158	6	4.693	1.341	
B X C	4.293	2	2.147	0.613	
A X B X C	13.245	6	2.207	0.631	
Error	336.027	96	3.500		

Table 7Rest 2 Heart Rate (Mean of 10 Second Intervals)

Source of Variation	Sum of Squares	df	Mean Squares	F	p
A: Systems	17.603	3	5.868	1.772	
B: Arousal	4.230	1	4.230	1.277	
C: Communications	2.836	2	1.418	0.428	
A X B	7.011	3	2.337	0.706	
A X C	37.444	6	6.241	1.885	
B X C	9.687	2	4.843	1.463	
A X B X C	13.228	6	2.205	0.666	
Error	317.913	96	3.312		

Table 8Heart Rate Increase (Task less Rest 1)Based on Means of 10 Second Intervals

Source of Variation	Sum of Squares	df	Mean Squares	F	p
A: Systems	.240	3	.080	0.082	
B: Arousal	17.711	1	17.711	18.156	<.001
C: Communications	.341	2	.171	0.175	
A X B	.296	3	.099	0.101	
A X C	6.648	6	1.108	1.136	
B X C	1.072	2	0.536	0.549	
A X B X C	2.693	6	0.449	0.460	
Error	93.648	96	0.976		

Table 9Heart Rate Decrease (Task Less Rest 2)Based on Means of 10 Second Intervals

Source of Variation	Sum of Squares	df	Mean Squares	F	p
A: Systems	1.150	3	.383	0.472	
B: Arousal	17.091	1	17.091	21.064	<.001
C: Communications	17.273	2	8.637	10.644	<.001
A X B	.355	3	.118	0.146	
A X C	2.988	6	.498	0.614	
B X C	1.155	2	.577	0.712	
A X B X C	1.669	6	.278	0.343	
Error	77.892	96	.811		

Table 10Heart Rate Recovery (Rest 2 Less Rest 1)Based on Means of 10 Second Intervals

Source of Variation	Sum of Squares	df	Mean Squares	F	p
A: Systems	1.477	3	.492	0.626	
B: Arousal	.005	1	.005	0.006	
C: Communications	14.314	2	7.157	9.097	<.001
A X B	.051	3	.017	0.022	
A X C	5.573	6	.929	1.181	
B X C	.068	2	.034	0.043	
A X B X C	2.353	6	.392	0.498	
Error	75.530	96	0.787		

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